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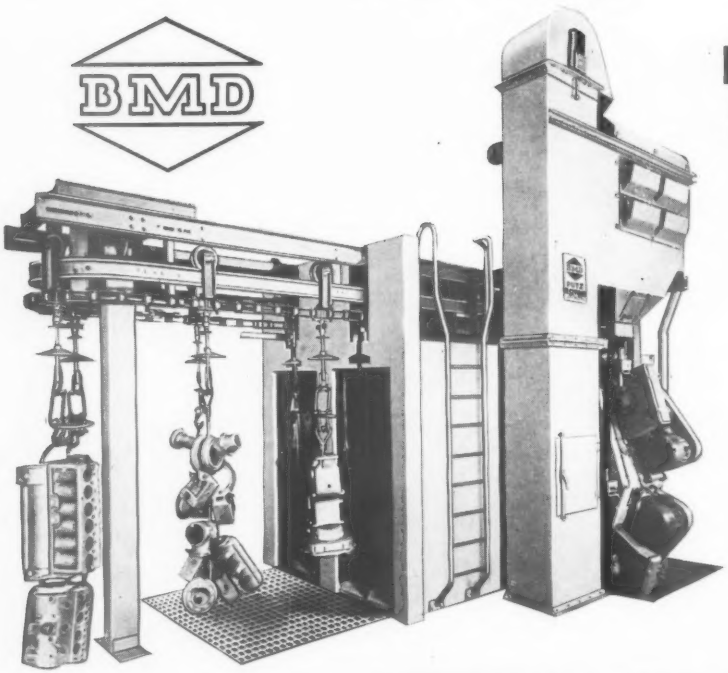

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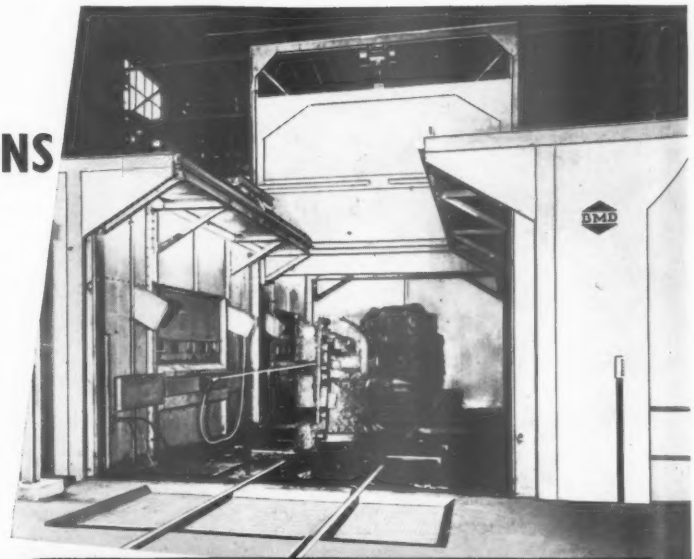

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CO_2 (?) Process

Probably the CO_2 Process has had a greater impact on the conduct of the foundry industry than any other process since the war—even more than the shell-moulding process. It was in the nature of things that it would be the subject of intense investigation and it has been established that the hardening effect is based on increasing the viscosity of the silicate of soda. More recently, according to the last edition of *Modern Castings* to reach us, it has been shown that CO_2 gas is not an essential part of the process and that dry nitrogen is equally effective for small work. Actually, for equal gassing times—a matter of 30 sec.—nitrogen is reported to give slightly superior tensile strength.

Dry air was also included in the tests and this, too, gave good results. The supply was taken from the compressed-air line at 85 lb. per sq. in. and the moisture removed by passing through a calcium-chloride drier. In all cases, the pressures were reduced to 10 lb. per sq. in. for the actual process of gassing. The tests were carried out on samples normally used for core-sand testing and so were quite small. When dry gases were applied to larger cores, it was found that the changing of the nature of the sodium silicate was too slow a process, and CO_2 gassing gave a quicker set to large cores, though the strength and scratch-hardness were considerably below the values to be associated with atmospheric drying.

This question of large cores is important, as the Author of the article, Mr. Carl E. Wullf, has limited his advocacy of dry gases to small work and larger cores will still require CO_2 gas for producing the initial set. The preliminary inquiries we have made indicate that nitrogen would be a cheaper gas to use than CO_2. Moreover, in the future, considerable quantities should become available as a by-product from the production of cheap oxygen for steel-making purposes. All that this preliminary research has done is to suggest a new field for research in the domain of coremaking. The great progress that has been made with the CO_2 Process warrants further experimentation in a field which has in so many cases been proved to have been profitable, namely, the making of large cores and mould sections. It is not thought that either dry air or nitrogen will replace CO_2, but like most other developments will find its own niche in future foundry practice. As a "rider" to these experiments, some tests were made on the milling of sand/silicate mixtures, and as a result, the author of the article published by our US contemporary recommends further the use of a sealed muller, mainly because sand which has become partially dried out during milling will have a reduced bench life.

Institute of Vitreous Enamellers

Annual Conference at Chester, October 3 and 4

The 1957 annual conference of the Institute of Vitreous Enamellers is to be held at the Grosvenor Hotel, Chester, on Thursday and Friday, October 3 and 4, and programme details are recorded below.

The Cheshire/Lancashire area has been selected this year in order to accommodate Council's desire to hold conferences throughout the country and arrange works visits of varying interest, and it is fortunate that in this area there is a works visit of exceptional interest. Further, a very instructive programme of technical papers has been arranged. Members are advised to reserve hotel accommodation as soon as possible; the conference headquarters will be at the Grosvenor Hotel.

Programme

Thursday, October 3

9 a.m.—Assemble at Grosvenor Hotel for works visit to John Summers & Sons, Limited (full day, with luncheon by invitation of the company).*

7 for 7.30 p.m.—Informal dinner.

Friday, October 4

10.15 a.m.—Session 1. "Continuous Surface-pretreatment Processes at Shotton, with particular reference to Nitec Sheet for Vitreous Enamelling," by D. A. Winton and W. H. F. Tickle.

11.30 a.m.—Session 2. "Abrasion-resistance Tests," by J. A. Clarke.

2 p.m.—Session 3. "Architectural Enamelling," by J. Herson.

3 p.m.—Session 4. "Enamelling of Aluminium," by A. Biddulph.

4 p.m.—Session 5. "Application of Vitreous Enamel by the Electrostatic Process," by S. Hallsworth.

7.30 for 8 p.m.—Annual banquet, followed by dancing until 1 a.m.

Ladies' Programme

Thursday, 10.30 a.m.: Depart Grosvenor Hotel for Chirk Castle; visit followed by luncheon at the Hand Hotel, Llangollen, and return *via* Valle Crucis Abbey and the Horseshoe Pass, arriving at Chester at approximately 4.30 p.m.

Friday, 10.30 a.m.: Morning coffee; demonstration on beauty culture; 12.30 p.m.; luncheon with delegates, afternoon free.

Those members who have not already signified their intention to attend the conference but who wish to be included in the arrangements should register with the secretary—J. D. Gardom, Ripley, Derbyshire—immediately.

* On the visit to John Summers and Sons, Limited, it should be particularly noted that the official recognised transport arrangements must be used.

Norwegian-Reactor Project

The United Kingdom Atomic Energy Authority and the Norwegian Institute for Atomic Energy have recently signed an agreement for co-operation in connection with the Norwegian Halden reactor project. This is concerned with an experimental reactor, scheduled to start operation early in 1958, which is designed to produce process steam suitable for wood-pulp mills and other industrial uses. The Authority have undertaken to supply the initial charge of uranium-fuel elements for the reactor.

American Letter

American Society of Mechanical Engineers

The programme for the Fall Meeting of the American Society of Mechanical Engineers (ASME), to be held from September 22 to 25, at the Hotel Statler, Hartford, Connecticut, contains technical papers involving foundry products under the following titles:

Metals Engineering: Evaluation of Ductile Iron as an Engineering Material; Mechanical Properties of Grey Cast Iron; Development and Testing of Magnesium-alloy Wheels; Correlation of Elevated-temperature Data on Steel Castings; Process Controls for Making Turbine Castings; Weld Fabricated and Repaired Steel Castings for Nuclear Service; Virtues of Chill-cast Surfaces for Various Applications; Use of Non-destructive Testing on Steel Castings for Elevated-temperature Service; Cast 9 per cent. Nickel High-strength Steel for Low-temperature Service; Specifications as Related to Design Quality in Steel Castings; Functional Analysis to Final Design of a Steel Casting; Design Characteristics of Magnetic Steel Castings; A 100-tons per sq. in. Commercial Cast Steel, and Basic Machining of Medium and Heavy Steel Castings.

Business Activities

US foundry activities in textile, farm machinery, paper, mining, shipbuilding, machine tools and aircraft have been reduced but are balanced to some extent with gains in railroad equipment, foods, packaging, business equipment, electrical equipment and service industries.

Scrap prices in the steel markets are soft. Proposals to raise the sunken ship Andrea Doria have been outlined; the ship is submerged in 225 ft. of water and raising her is expected to cost about $4,000,000. If successful, it will provide $30,000,000 worth of usable ship or alternatively $10,000,000 worth of scrap.

US businessmen are worried about prices, consumer intentions and over-capacity. Reduced demands for non-ferrous metals have shown effects on dividends for producers and lower prices for consumers. Inventories of lead, zinc and copper, which have been increasing until August, are considered excessive and are being reduced.

Copper prices are lower (as reported on page 328 of this issue—EDITOR) and reduced inventories and improved demand are expected to sustain the prevailing price structure. Prices of aluminium ingot have advanced one cent a pound to 26 cents.

Journal Subscription Rates

A number of postal and production cost increases in recent years have been absorbed without adding to the price of subscriptions to the FOUNDRY TRADE JOURNAL, but with the increased postage rates due in October it is obvious that this policy cannot continue.

Thus, the publishers are reluctantly compelled to announce an increase in subscription rates which will apply from October 1, 1957. From this date, the annual subscription for the JOURNAL (postage paid) will be 52s. in the UK and 60s. abroad; single copies will be 1s. (plus postage) for both home and overseas readers.

THE CUTLERS' HALL, SHEFFIELD, was visited by Mr. W. J. Cheesman, Assistant Trade Commissioner in Accra, on Monday and Tuesday, September 9 and 10, to enable members of Sheffield Chamber of Commerce to interview him about conditions in newly-created Ghana for exports.

Dust Control in Foundries*

By W. B. Lawrie, M.B.E., M.Sc., F.R.M.S., A.I.M.; A. T. Holman, O.B.E., M.I.Mech.E., and J. L. Burgess, B.A.

Practical experience has resulted in certain modifications to the equipment which is now used to apply the low-volume, high-velocity ventilation system to pneumatic chisels and portable grinders, although the system itself remains fundamentally unchanged. More-recent work has shown that the method can also be successfully used to control the dust produced by radial wire-brushes, cup wire-brushes, hand wire-brushes and sanding discs. The developments were based on an examination of the movement of dust clouds within the respirable size range, by means of observation and photographic technique; some of the original photographs are included in this paper. It was found that under laboratory conditions all the machines provided a high standard of dust control.

An original method of local-exhaust ventilation which became known as the low-volume high-velocity system was first developed for a pneumatic chisel and a portable abrasive-wheel[1]. Later, the system was applied to a bench-grinder, a portable surface-grinder and a swing-frame grinder, preliminary experiments indicating that the method could also be used to control fumes produced by the fluxing of magnesium[2, 3]. A rubber sleeve was then developed to fit the pneumatic chisel and in addition, a conical extension duct was produced, this could be added to the sleeve to deal with large quantities of dust[4]. At the same time, a part of the encircling ring of the portable surface-grinder was cut away for ease of use and an extractor head was developed for the portable-grinder so that the dust-control system could be used with or without the wheel guard. This extractor head was also fitted to a transverse swing-frame grinder[4]. Further modifications have been made to both the chisel sleeve and the extractor head, and the system has also been fitted to a disc sander and three types of wire-brushes.

Pneumatic Chisel

The original work showed that dust produced by a pneumatic chisel could be controlled through a duct held over the operator's hand, above the chisel point[1]; through a hollow chisel[1], or through a rubber sleeve fitted over the chisel itself[4]. For a variety of reasons, the rubber sleeve has been used as the standard method and practical experience has led to certain slight modifications in the design of the sleeve. Fig. 1 shows the standard sleeve together with the clips used to bind it on to the chisel and the conical extension duct which can be added if large amounts of coarse dust have to be controlled. A vacuum of five inches of mercury extracts about 6.5 cub. ft. of free air per minute, and the dust and air pass from the sleeve to a lightweight plastics hose of ¾-in. dia.

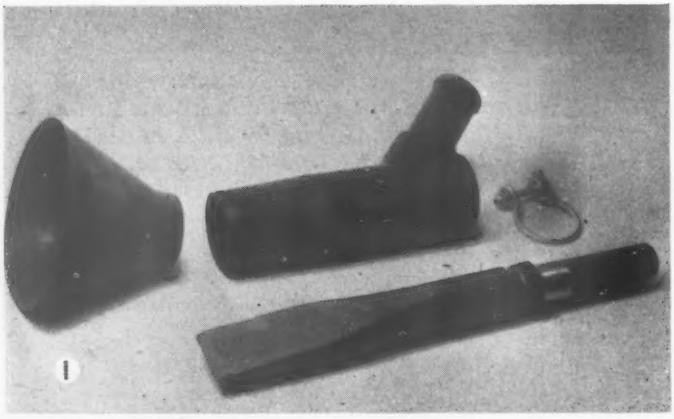
Portable Abrasive Wheel

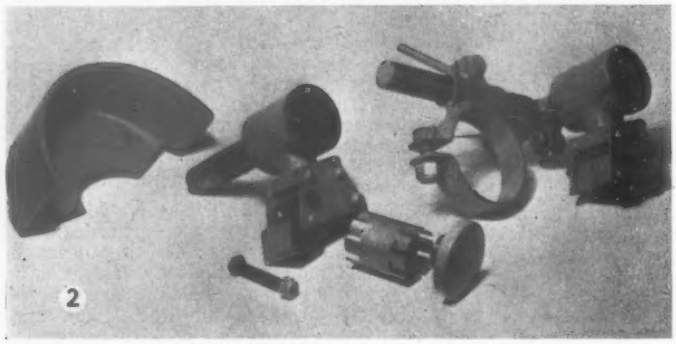
The extractor head which was developed for this machine collects some sparks as well as the dust. When certain metals are being ground (*e.g.* steel) the sparks are hot enough, as they flow down the polythene hose, to soften the plastics wall so that the hose may collapse and obstruct the airflow. A spark trap has therefore been designed to overcome this difficulty. A rotor is so placed inside a cylinder, mounted on the extractor head, that it revolves in the air stream. The sparks impinge on this rotor and are cooled before being carried down the hose pipe. The rotor is self-cleaning by reason of its movement and the end of the cylinder can be removed to clean out any metal that might be deposited in it. The extractor head is still easily adjustable for wheel sizes from 8- to 2½-in. dia., and extracts 40-cub. ft. of free air per minute through a ¾-in. plastics hose, at a vacuum head of 5 in. of mercury. The spark trap, which does not impair the dust-control system, weighs only 3½ ounces and is not necessary for the grinding of iron or most other metals; however, it does allow the system to be used on those metals which give rise to very high temperature sparks. Fig. 2 shows a wheel with a spark trap fitted, together with a view of the dismantled spark trap.

Radial Wire-brush

Power-operated, portable, radial wire-brushes are often used to clean castings and to remove scale and paint before painting or re-painting; these operations generate heavy dust clouds. It has been found that the extractor head, which was developed for the portable grinder, can be used to control the dust from all these operations, when the brush is rotating at speeds which are high enough to give efficient brushing. The extractor head was designed for a one inch wide brush and gives good dust control, when extracting 40 cub. ft. of free air per min. at a vacuum of five in. of mercury, the dust and air passing through a ¾ in. dia. plastic hose for disposal in a filter. Figs. 3 and 4 indicate the measure of dust control achieved when brushing rusty steel plate and Table I gives the correspond-

* Paper presented to the Coventry & District section of the Institute of British Foundrymen. The Authors are, respectively, H.M. Engineering Inspector of Factories; chairman, Holman Bros., Limited, and general manager of Dustuctor, Limited.





FIGS. 1 AND 2.—*Ancillary equipment for low-volume high-velocity dust extraction. Fig. 1, Pneumatic chisel, showing the rubber sleeve, retaining clip and conical extraction duct, for use when heavy burdens of dust particles are liberated, and Fig. 2, portable-grinder fitting with extractor head and spark trap is shown together with a detached extractor head and dismantled components.*

TABLE I.—*Dust Concentration at Various Positions near a Radial Wire-brush Determined by Dust Counts from Samples Collected in Owens Jet, Konimeter and Thermal Precipitators, under Laboratory Conditions.*

OWENS JET SAMPLES.

No.	Test position.	Particles per ml.
1	General atmosphere	50
2	Near brush—with exhaust	50
3	Breathing level—with exhaust	50
5	12 in. from extractor head—with exhaust	<100
4	6 in. from extractor head—with exhaust	100
6	Close to extractor head—with exhaust (Sample taken in the dust cloud as it was being collected)	3,200
24	Near brush—without exhaust	10,000
25	Breathing level—without exhaust	10,000

KONIMETER SAMPLES.

No.	Test position.	Particles per ml.
1	General atmosphere	No recognisable spot
2	Near brush—with exhaust	72
3	Breathing level—with exhaust	34
5	12 in. from extractor head—with exhaust	58
4	6 in. from extractor head—with exhaust	48
6	Close to extractor head—with exhaust (Sample taken in the dust cloud as it was being collected)	286
24	Breathing level—without exhaust	Too many to count

THERMAL PRECIPITATOR SAMPLES.

No.	Test position.	Particles per ml.
1	General atmosphere	169
2	Breathing level—with exhaust	405
8	Breathing level—without exhaust	13,653

ing dust counts taken in laboratory conditions.

None of the samples was incinerated, the Owens Jet samples being estimated[5, 6], the Konimeter samples counted on the instrument itself, and the Thermal Precipitator samples counted to the limit of visibility in light-field illumination. It will be seen that all the results indicate a high standard of dust control and confirm the observations and photographs. The Owens Jet and Konimeter samples numbered 4, 5 and 6 were taken in the same plane as the extractor head in an effort to determine the extent to which the dust cloud might pass the head before being collected. Using the Owen Jet counts, the dust cloud developed by the process was of the order of 10,000 particles per ml. (samples No. 24 and 25). This was almost completely controlled so far as the breathing level of the operator was concerned and samples 4, 5 and 6 show that at a distance of six inches in front of the head and in the same plane as the head, the cloud was also under control. The sample taken close up to the head gave a count of 3,200 particles per ml., so that about one-third of the fine dust just passed the head. It did not, however, move radially more than about an inch before being re-collected.

Cup Wire-brush

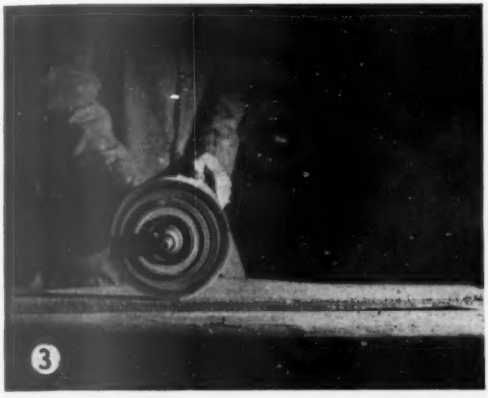
The method originally developed for surface grinders has now been applied to cup wire-brushes; heavy dust clouds that are produced by these machines can be controlled by a vacuum of five inches of mercury, when the system extracts about 33 cub. ft. of free air per min. through a ¾-in. dia. hose. This hose is coupled to a peripheral duct, on the inside surface of which ports are spaced so as to provide an even flow of air round the brush. The peripheral duct, which is surrounded by a nylon fringe, does not completely encircle the brush, part of it having been cut away for flexibility of operation.

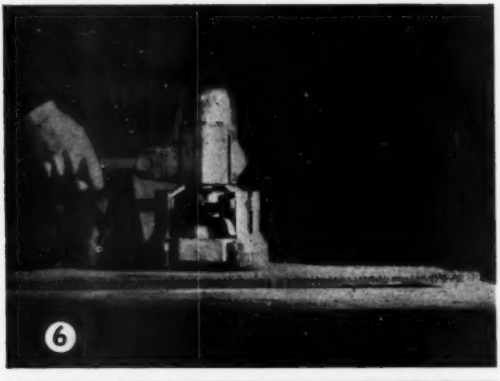
FIGS. 3 TO 8.—*Applications to rusty steel plates, of wire-brushes and sanding tools, before and after low-volume, high-velocity exhaust systems have been incorporated.*

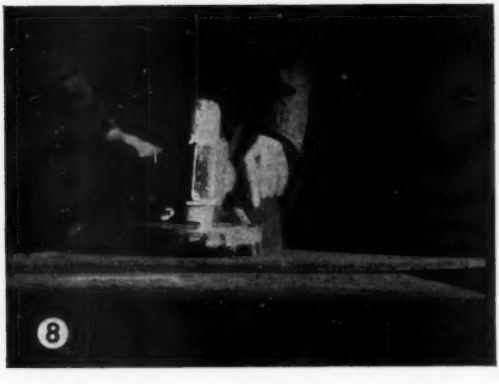
Fig. 3, *wire-brush in use, on a rusty steel plate, the dust cloud liberated by the abrasion can be clearly seen; Fig.* 4, *under identical circumstances but with the exhaust system operating, the dust cloud is eliminated.*

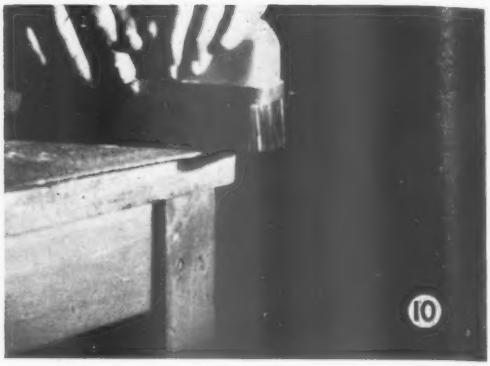
Figs. 5 *and* 6 *show similar illustrations of the use of a cup wire-brush, where the hood (Fig.* 6) *effects complete removal of dust and fumes in the respirable-size range.*

Figs. 7 *and* 8 *reveal the effectiveness of a similar exhaust system applied to disc grinding a rusty steel plate.*









FIGS. 9 AND 10.—*Effect of the application of the low-volume, high-velocity dust exhaust equipment on the dust burden generated from a hand wire-brush, Fig. 9 showing the dust cloud generated without exhaust and Fig. 10 with the exhaust system in operation.*

Figs. 5 and 6 show the conditions when cleaning a rusty plate with and without exhaust, these observations being confirmed by the dust counts which are given in Table II. It will be seen that a good standard of dust control was achieved in laboratory conditions and the Konimeter and Owens Jet samples numbered 9, 10 and 11 indicate that the dust cloud was controlled within 6 in. of the exhaust system.

TABLE II.—*Concentrations of Dust Particles at Various Positions near a Cup Wire-brush, as Determined by Dust Counts on Samples from Owens Jet, Konimeter and Thermal Precipitator Equipment, under Laboratory Conditions.*

OWENS JET SAMPLES.

No.	Test position.	Particles per ml.
7	Near brush—with exhaust	<100
8	Breathing level—with exhaust	<100
11	12 in. from machine—with exhaust	<100
10	6 in. from machine—with exhaust	600
9	Close to machine (Sample taken in the dust cloud as it was being collected)	6,000
22	Near machine—without exhaust	10,000
23	Breathing level—without exhaust	10,000

KONIMETER SAMPLES.

No.	Test position.	Particles per ml.
7	Near brush—with exhaust	84
8	Breathing level—with exhaust	68
11	12 in. from machine—with exhaust	60
10	6 in. from machine—with exhaust	56
9	Close to machine (Sample in edge of dust cloud as it was being collected)	122
23	Breathing level—without exhaust	Too many to count

THERMAL PRECIPITATOR SAMPLES.

No.	Test position.	Particles per ml.
3	Breathing level—with exhaust	699
7	Breathing level—without exhaust	28,888

Sanding Disc

A somewhat similar application of the system has proved successful on the sanding discs. In this case the duct with its nylon fringe completely surrounds the disc and dust is extracted through a ¾ in. dia. plastics hose passing 33 cub. ft. of free air per min. at a vacuum head of five inches of mercury.

The effect of the exhaust system can be seen by comparing Figs. 7 and 8. These photographs were taken when the machine was operating on rusty steel plates and the dust counts given in Table III confirm the observations and indicate the level of dust control which was attained under laboratory conditions. Here again, the Owens Jet samples numbered 15, 16 and 17, and the Konimeter samples numbered 15, 16 and 18 indicate that the dust cloud was controlled within a distance of 6 in. from the outside periphery of the exhaust duct.

TABLE III.—*Dust Concentration in the Vicinity of a Sanding Disc, in Use on a Rusty Steel Plate, Under Laboratory Condition, as Measured by Dust Counts, in the Respirable Size Range.*

OWENS JET SAMPLES.

No.	Test position.	Particles per ml.
12	General atmosphere	<100
13	Near sander—with exhaust	400
14	Breathing level—with exhaust	100
17	12-in. from sander—with exhaust	400
16	6 in. from sander—with exhaust	800
15	Close to sander—with exhaust. (Sample taken in the dust cloud as it was being collected)	1,200
20	Near sander—without exhaust	10,000
21	Breathing level—without exhaust	10,000

KONIMETER SAMPLES

No.	Test position.	Particles per ml.
12	General atmosphere	50
13	Near sander—with exhaust	64
14	Breathing level—with exhaust	46
18	12 in. from sander—with exhaust	44
16	6 in. from sander—with exhaust	40
15	Close to sander—with exhaust	32
21	Near sander—without exhaust	Too many to count
22	Breathing level—without exhaust	Too many to count

THERMAL PRECIPITATOR SAMPLES.

No.	Test position.	Particles per ml.
5	General atmosphere	116
4	Breathing level—with exhaust	625
6	Breathing level—without exhaust	23,576

Hand Wire-brush

The low-volume high-velocity system was first applied to a hand wire-brush by Mr. W. H. White, of the British Cast Iron Research Association. These brushes are frequently used to clean castings, when they produce very heavy atmospheric-dust concentrations. This dust can be controlled by a vacuum of 5 in. of mercury. Ports were drilled through the wooden back of the brush and connected to a duct running along its length. A lightweight plastics hose was used to connect this duct to a filter and a vacuum source, a nylon fringe being added in such a fashion that it surrounded the bristles. A comparison of Figs. 9 and 10 shows the measure of dust control that was achieved in laboratory conditions.

Conclusions

The recent work on the low-volume high-velocity exhaust system has resulted in certain modifications to existing equipment and has given new designs which will control dust from all types of wire-brushes and from a disc sander. It has been found that the system gives good dust control when operating on dust clouds within the respirable-size range for which it was originally devised. It has also been found that it will control dust particles within a wide size-range and the extractor head fitted to portable grinders will in fact collect a large proportion of the sparks. Special arrangements have therefore had to be made to deal with these sparks in cases where their temperature was high enough to damage the plastics hose through which the dust was passed to filters.

The main object has been the control of the health risks associated with many of the machines and so all the developments have been based on the observation and photography of particles below 10 microns in diameter. The optical results have been confirmed by dust counts on samples taken with an Owens Jet Counter, a Konimeter and a Thermal Precipitator and all the machines have showed a high standard of dust control when tested in laboratory conditions.

Acknowledgment

One of the Authors (Mr. W. B. Lawrie) wishes to express indebtedness to Sir George Barnett, H.M. Chief Inspector of Factories, for permission to engage in this work and to publish the results.

REFERENCES.

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PERA Investigate Ceramic Tools

The Production Engineering Research Association is at present investigating at its Melton Mowbray headquarters the performance of six types of ceramic tool on behalf of the Ministry of Supply. For purposes of comparison similar tests are being carried out on cemented-carbide tools. Special equipment required for the investigation has been made, and preliminary tests are also being carried out to establish the ranges of cutting conditions to be employed, and to determine the wear characteristics of various ceramic materials.

Ceramic cutting materials have very high resistance to abrasive wear, even at high temperatures. Under favourable circumstances, ceramic tools have been used at speeds many times higher than can be achieved with conventional cutting tools. For example, cast iron has been machined at a speed of nearly 1,000 ft. per min., and steel at a speed of over 1,100 ft. per min. An additional advantage is that the principal constituent of ceramic tools is aluminium oxide which is obtainable from freely available raw materials. Ceramic cutting tools are, however, in their early stages of development, and a number of technical problems will have to be solved before the full possibilities of this type of tool are realized in industry generally.

The performance of the tools will be determined over a range of cutting speeds and feeds when rough and finish machining alloy steel. Performance will be assessed on the basis of tool wear in roughing operations and of workpiece surface finish in finishing operations. The machining experiments will be performed on a 17-in.-swing, high-speed centre-lathe with built-in running centre and variable speed range. As vibration has a particularly destructive effect on the performance of ceramic tools, special attention is being given to the vibration characteristics of the machine tool and tooling generally. An examination will also be made of some economic aspects of the use of ceramic tools by carrying out tests in which the effects of various feed and speed combinations giving constant rates of metal removal will be explored. The effects of cutting speeds of up to 1,600 ft. per min. and feed rates of up to 0.030 in. per rev. will be investigated during the tests.

Steel Castings Specifications

Between 1935 and 1953, 16 separate specifications for steel castings used in general engineering were published by the British Standards Institute; they dealt with a considerable variety of materials ranging from high-alloy steels to carbon steels. B.S. 3100, now published, brings all these standards together in a single publication. Reviewing these standards, it became apparent that the clauses covering "general requirements" varied to a greater or lesser extent in each of the standards and it was therefore decided to co-ordinate these requirements. The BSI committee entrusted with the task of co-ordination took the opportunity to review the chemical compositions and mechanical properties specified in these standards and has in some cases made certain amendments to meet modern practice.

The specific requirements of the 16 specifications contained in this new 40-page publication accordingly have a common general basis. These specific requirements are listed in the second part of the standard. The original numbers of each of the steel casting specifications have been retained to avoid possible confusion on existing drawings. B.S. 3100 costs 7s. 6d., and is obtainable from the Institution, 2, Park Street. London, W.1.

Purchasing Officers Association

Conference and Minibition at Folkestone

The annual conference of the Purchasing Officers' Association, together with a Minibition, will be held at the Hotel Metropole, Folkestone, from Thursday, September 26 to 28. The business programme will include, on Friday, September 27, an address on "The Rôle of Industry" by the president of the Federation of British Industries, Sir Hugh Beaver, K.B.E.; this is to be followed by a discussion on "European Free Trade and its Effect on the Industrial Buyer." On Saturday, September 28, Mr. T. H. Blakeley, B.SC., general manager of the Morgan Crucible Company, Limited, will speak on "Carbon and Carbon Products." "Powder Metallurgy" will be the subject of a talk by I. Jenkins, D.SC., F.I.M., chief metallurgist of the English Electric Company, Limited.

The Minibition (an exhibition, having stands of a uniform format, and each 5 by 3-ft., for single and 10 by 3-ft. for double stands) comprising exhibits from over 100 firms drawn from all sections of British industry, will be open on Thursday from 11 a.m. to 6 p.m., whilst on Friday and Saturday admission, which will be restricted to members, will be from 9 a.m. to 11 p.m., and 9 a.m. to 6 p.m., respectively.

Founders exhibiting products include Ashmore, Benson, Pease & Company, Limited (castings); Birfield Industries, Limited (valves and metering devices); Crane, Limited (valves); W. H. Dorman & Company, Limited (castings and joints); Firth-Vickers Stainless Steels, Limited ("Staybrite" stainless steels); Great Bridge Foundry Company, Limited (castings); Gummers, Limited (steam, oil and water valves); John Harper & Company, Limited (castings and enamelling); F. H. Lloyd & Company, Limited (steel castings); Mavor & Coulson, Limited (engineering products); Herbert Morris, Limited (hand- and electric-lifting blocks); Qualcast, Limited (castings); Scottish Precision Castings, Limited (die-castings); Triplex Foundry Company (castings), and Henry Wallwork & Company, Limited (castings).

Foundry Equipment Business

During the second quarter of this year, the foundry equipment industry exported £300,000 worth of machinery of which £60,000 consisted of sand-preparing machinery; £78,000 of moulding machines; £81,000 of shotblast plant; £18,000 of melting furnaces and ladles; £13,000 of coremaking machinery; and £50,000 of other equipment including chaplets and studs, but excluding mechanical-handling plant and materials such as abrasives. To the home market the industry sold £272,000 worth of sand-preparing plant; £284,000 of moulding machines; £281,000 of shotblast plant; £64,000 of melting equipment (to include ladles); £40,000 of coremaking plant; and £183,000 of other equipment as limited as for exports. The number of firms making these returns numbered 49, and the grand total of the business effected was £1,425,000.

TO ENABLE it to complete an expansion programme designed to raise output from a little over 1,000,000 tons to 2,000,000 tons per annum, the Tata Iron & Steel Company, Limited, is to borrow an amount equal to what it can raise elsewhere, subject to a maximum of $17,500,000, from the World Bank. Negotiations are currently proceeding with a group of leading commercial banks in the United States for medium-term credits up to a total of $17,500,000.

Wellman Smith Owen's Record Order Book

Volume of orders on hand is greater than at any time in the company's history, states Sir Peter Roberts, chairman of the Wellman Smith Owen Engineering Corporation, Limited, in his annual review. An even greater demand for capital equipment is anticipated as plans for expansion of the British iron and steel industry materialize.

Work has started on an extension of the heavy fitting shop at Darlaston and additional machine tools are ordered for the Darlaston and Belfast works. The company will be responsible for the design and construction of the complete open-hearth steelmaking section of the British plant at Durgapur, India, and work, which is now proceeding, will be spread over about five years.

In addition to the increasing volume of orders for heavy steelworks equipment, contracts totalling more than £1,000,000 have been secured during the year for mechanical handling and processing units for the manufacture of steel strip—about one third being for export.

Sir Peter adds that while the company is assured of work the difficulty is to obtain a reasonable return on capital invested. Competition is becoming keener, but operating in an essentially industrial field, the company should continue to expand. Group net profits were little changed at £285,173 (£280,589) and the dividend is repeated at 22½ per cent.

New DSIR Service for Industry

On the recommendation of industry, a new test-rig for measuring the head/loss characteristics of fittings for oil hydraulic circuits has been put into operation at the Mechanical Engineering Research Laboratory of the Department of Scientific and Industrial Research. It is expected that results from the rig will remedy the shortage of reliable information about the flow characteristics of the various fittings now in use. Manufacturers are invited to send representatives, with a range of their fittings, to work on the rig under the supervision of the staff of the laboratory.

Firms interested in taking advantage of this service should send details of their products and the range of tests they require to the director, Mechanical Engineering Research Laboratory, East Kilbride, Glasgow.

Professional Photography Exhibition

The many ways in which photography is now being employed are well illustrated at the exhibition of professional photography currently being held at the R.B.A. Gallery, Suffolk Street, Pall Mall, London, S.W.1. Subjects covered range from commerce and industry to fashion and child portraiture, from advertising to memorial panels. Of the 1,000 entries in monochrome received this year, 584 have been accepted, and colour transparencies, stereos and film strips are also featured. The Institute of British Photographers are the organizers of the exhibition which will be open to the general public tomorrow (Friday) and Saturday from 10 a.m., to 7 p.m., and on Monday and Tuesday (closing day) from 10 a.m. to 5 p.m., price of admission 2s.

Stockholm Diary . . . By A. R. Parkes

Comment on Proceedings, Personalities and Events of the International Foundry Congress, 1957

(*Continued from page 278*)

This concluding section of the eye-witness report on the Congress held in Stockholm from August 19 to 24 gives details of the closing session, notes on international committee work and on the presentation of awards. Brief particulars are included (in tabular fashion) of the post-Congress tours and the types of works visited during these, and the whole review ends on a note of congratulation for the organizers and appreciation of the generous hospitality dispensed.

Closing Session

The closing ceremony of the Congress took place before an assembly of about 500 delegates and ladies in a long narrow salon (or parlour) of the Parliament building which had been the week's Congress headquarters in Stockholm. Representing the Congress organizers at this function were, from left to right, Mr. G. Lambert, secretary, and Dr. A. B. Everest, president, respectively, of the International Committee, Mr. Lagercrantz, chairman of the board of directors of the Swedish Metalworking Association (*Sveriges Mekanforbund*), who presided over the Congress, Dr. G. Schwietzke, vice-president of the Committee, and Mr. V. Delport, its hon. treasurer.

Mr. Lagercrantz formally opened the session, saying that he hoped the stay of Congress delegates in Sweden had been both profitable and enjoyable. He then called on Dr. Everest to report on the Congress and deliberations of the International Committee and its sub-committees.

Dr. Everest prefaced his reports by emphasizing how much delegates appreciated the hard work put in by the local teams in organizing the Congress. The pleasures all had enjoyed that week, he said, were indeed the fruits of years of intensive preparation. He voiced the thanks of the assembly to the staff in the Congress office, in particular for the tactful and helpful way in which all queries had been dealt with, and concluded these remarks by stressing the development of international accord and friendship which the whole Congress epitomized, including in this context the organizers from the other Scandinavian host countries.

Committee Work

Passing on to review the work carried out under various sub-sections of the International Committee, Dr. Everest then reported as follows:

(*a*) *International Dictionary Committee.* For this committee, formed under the presidency of *Comm.* Olivo, the secretariat had now been transferred to France. Five new sections of the dictionary had been circulated among committee members for study, but, said Dr. Everest, the end was now in sight—in the form of a dictionary recognizing and defining over 2,000 foundry words in seven languages. Means for its publication were now being investigated and it was recommended that once established in this way the words so defined would be used by technical authors throughout the industry and especially by translators.

(*b*) *Defects Committee.* Volumes I and II (already published) of the International Atlas of Defects had proved a great success; the first was now out of print and the second nearly so; new editions were being prepared. A bibliography of defects had been prepared under the chairmanship of Mr. G. Henon and was now on sale. Work was proposed on the effect of residual and trace impurities on casting defects and a small working panel of the sub-committee had been formed to extend the work.

(*c*) *Testing Cast Iron.* The International Standards Organization had been using this sub-committee's findings for its own guidance and had put forward already a specification based on a tensile test; this was being studied and a report would be made. The activities of the Testing Committee had thus been accelerated and a small panel had been formed in this instance also, to study other methods of test for specification purposes. This Committee has also considered an Atlas of Microstructure and may recommend the issue of a graphite classification standard. Dr. Jungbluth has retired from the Chair and is succeeded by Prof. de Sy, with Dr. J. G. Pearce (BCIRA) as vice-chairman.

Among other International Committee news, Dr. Everest disclosed that the foundry associations of Czechoslovakia, Poland and Yugoslavia had assumed full membership from January 1 last, while Israel had been elected at the present Congress. From January 1, 1958, Dr. G. Schwietzke would take over the presidency and the Italian association had been asked to nominate a president for the 1959 session; Mr. Lambert and Mr. Delport had been re-elected as secretary and honorary treasurer respectively.

Future Congresses

The 1958 International Congress will be held in Brussels and Liège, Belgium, from September 29 to October 3, during the period of the Brussels World Fair. (It is probable that the opening

TABLE II.—*Scandinavian Works visited During Post-Congress Tours.*

Visit No.	Period.	Works.	Location.	Type.
SWEDEN.				
21	August 26 to 27	AB Nordiska, Armaturfabrikerna Linköping	133 miles S.W. of Stockholm	Iron and steel and non-ferrous foundries (700 tons iron, 600 tons copper-base, 2,000 tons steel and 150 tons light-alloy castings annually)
22	August 26 to 27	AB Motala Verkstad, Motala	163 miles S.W. of Stockholm	Steel foundry (6,000 tons heavy steel castings annually for railway engines, hydraulic presses, chemical industry, etc.)
23	August 26 and 27 Morning	Norrahammars Bruk Norrahammar	5 miles from Jönköping, 210 miles S.W. of Stockholm	Iron foundry (12,000 tons cast iron annually. Central heating boilers and similar castings)
	Afternoon ..	Husqvarna Vapenfabriks AB	Do. do.	Iron foundry (10,000 tons grey-iron castings annually. Heating and household articles, various thin-walled castings)
24	August 26 to 27	AB Gustavsbergs Fabriker, Västervik	184 miles S. of Stockholm	Malleable iron foundry (2,500 tons malleable castings annually, mainly fittings)
25	August 26 to 27	AB Ankarsrums Bruk, Ankarsrum	17 miles from Västervik, 195 miles S. of Stockholm	Iron foundry (4,000 tons grey-iron castings annually, also enamelled. Bath tubs, sanitary ware, etc.)
26	August 26 to 27	AB Volvo Pentaverken, Skövde	219 miles S.W. of Stockholm	Iron foundry (15,000 tons grey-iron castings annually. Engines and other kinds of automobile castings. Belongs to AB Volvo, Sweden's biggest car producer
27	August 26 to 27	AB Götaverken, Göteborg (Gothenburg)	–	Iron foundry (10,000 tons annually. Heavy motor castings, etc., for shipbuilding)
28	August 26 to 27	AB Davy Robertsons Maskinfabrik (Daros), Partille, near Göteborg	—	Iron foundry (4,000 tons grey-iron castings annually. Piston rings and cylinder castings; maximum weight 5 tons)
29	August 26 to 27	AB Johnsson-Verken, Örebro	125 miles W. of Stockholm	Mechanized non-ferrous foundry (2,000 tons annually light-metal and copper-base-alloy castings. Jobbing foundry, machine castings)
30	August 26 to 27	Björneborgs Jernverks AB, Björneborg	10 miles from Kristinehamn, 169 miles W. of Stockholm	Iron foundry (5,000 tons annually grey- and s.-g. iron castings Cylinder and light machine castings, rolls, heat- and acid-resisting castings)
31	August 26 to 27	AB Karlstads Mekaniska Werkstad, Karlstad	200 miles W. of Stockholm	Iron foundry. (9,000 tons iron castings annually. Heavy machine castings for the cellulose and paper industry, water turbines, etc.)
32	August 27 to 28	AB Limhamns Aduceringsverk Limhamn	Suburb to Malmo, 400 miles S.W. of Stockholm	Iron foundry. (2,000 tons malleable and 2,000 tons grey-iron castings annually, for excavators, tools, machines and building trades)
33	August 27 to 28	AB Åbjörn Andersson, Svedala	13 miles from Malmo, 410 miles S.W. of Stockholm	Steel foundry. (3,000 tons cast steel annually. Castings for crushers, roadbuilding machines, transport equipment, etc.)
DENMARK.				
41	August 26 to 28	A/S Burmeister & Wain, Köbenhavn (Copenhagen)	—	Iron, steel, and non-ferrous foundries. (14,000 tons grey-iron, 5,000 tons cast steel, and 300 tons non-ferrous castings annually. Principally diesel castings for shipbuilding)
42	August 28 to 29	De Forende Jernstoberier, Fredriksværk (near Hundested)	40 miles N.W. of Copenhagen	Iron foundry. (10,000 tons grey-iron, 500 tons malleable-iron castings annually. Boiler sections and various castings)
43	August 29 to 30	A/S H. Rasmussen & Company, Odense	100 miles W. of Copenhagen	Iron foundry. (10,000 tons grey-iron castings annually. Boiler, radiator and jobbing castings)
44	August 29 to 30	M.P. Allerups Eftf. A/S, Odense	100 miles W. of Copenhagen	Jobbing foundry. (4,000 tons grey-iron and 1,000 tons malleable-iron castings annually)
45	August 29 to 30	A/S Varde Stålværk, Varde (near Esbjerg)	175 miles W. of Copenhagen	Steel foundry. (5,000 tons alloy and carbon-steel castings ... ually weighing up to 10 tons for the machine and ship- ... ing industries)
46	August 29 to 30	A/S Ribe Jernstøberi, Ribe (near Esbjerg)	175 miles W. of Copenhagen	Iron ... dry. (7,000 tons of radiators and light grey-iron casti... or buildings)
47	August 29 to 30	Cement-Jern Konsortiet, Ålborg	Northern Jylland. 140 miles N.W. of Copenhagen	Annual ... duction 45,000 tons pig-iron in rotating cement furnace
NORWAY.				
51	August 26 to 27	Foss Jernstoperi, Oslo	—	Iron foundry. (5,000 tons grey-iron castings annually. Heavy and medium diesel-engine and miscellaneous castings. Electric arc furnace)
52	August 26 to 27	Aksjeselskapet Jötul, Oslo	—	Iron foundry. (7,000 tons light grey-iron castings annually. Automatic moulding unit, hot-blast cupolas)
53	August 26 to 27	Bentse Stoperi, Oslo ..	—	Iron foundry. (2,000 tons ordinary and 200 tons alloy cast iron. Machines for the paper and wood-working industries. Electric furnaces)
54	August 27 to 28	A/S Drammens Jernstoberi, Drammen	30 miles S.W. of Oslo..	Iron and steel foundry. (4,000 tons iron and 650 tons steel castings annually. Light castings)
55	August 27 to 28	A/S Jarlso Verft, Jarlso, near Tönsberg	60 miles S. of Oslo ..	Jobbing foundry. (3,000 tons iron castings annually. Light- and medium-machine castings. Induction furnaces)
56	August 27 to 29	A/S Sandnes Aducerverk, Sandnes	10 miles S. of Stavanger	Norway's only malleable foundry. 2,000 tons annually. Duplex hot-blast cupola/arc furnace melting shop; electric annealing furnaces
57	August 28 ..	Stavanger Electro-Staalverk A/S, Jorpeland	10 miles from Stavanger by boat	Steel foundry. (3,000 tons light and medium-size castings annually. Electric furnaces. Also steelworks)
58	August 28 to 29	A/S Bergens Jernstoberi, Bergen	—	Jobbing foundry. (3,000 tons grey-iron and 400 tons s.-g iron castings annually. Mainly light and medium castings for diesel engines, etc.)
FINLAND.				
61	August 26 ..	Lokomo Oy, Tammersfors	—	Steel foundry. Annual production 4,000 tons, including acid-resistant steel castings)
62	August 27 ..	Högfors Bruk, Karkkila	40 miles from Helsingfors	Iron and non-ferrous foundry. (18,000 tons iron, 400 tons non-ferrous castings annually. Boilers, sanitary ware, etc Highly mechanized)

sessions only will take place in the capital city and the remainder of the Congress will be in Liège.) The main theme will be the human aspects of foundry problems. In 1959, Spain will be the host country for a Congress in Madrid and Barcelona probably during October; in 1960, the Congress will be held in Switzerland; in 1961, an invitation to hold the Congress in Vienna, Austria, has been accepted; the 1962 (May) Congress will be in Detroit, and for 1963 an invitation has been received from Czechoslovakia.

Dr. Everest then concluded his report, after referring briefly to copyright and subscription matters and an agreed definition of the term "exchange paper," confining it to papers given at International Congresses.

Presentation of Awards*

Mr. Lagercrantz, after thanking Dr. Everest for his report, asked him to present the awards of the International Committee. The first of these was of the Perseus statue to be kept by the host country of the present Congress for one year with a miniature replica going to the permanent ownership of the man most outstanding, for services to the foundry industry of that country. The recipient of this honour, Dr. Everest announced, was Mr. Y. Granström of Sweden, nominated by all four host countries. (In view of Mr. Granström's delicate health the presentation of the statue had been made at a small private party on the previous evening.)

AFS Award to Vincent Delport

Dr. Everest next explained that the American Foundrymen's Society last spring had cited Mr. V. Delport, its European representative for many years, as a recipient of its Award of Merit. Dr. Everest took the opportunity of expressing the great pleasure of the International Committee and all delegates at this timely recognition of Mr. Delport's long service on the Committee. He had contributed greatly to building up the international foundry organization and all had benefited from his wise guidance and sympathetic friendship.

At the time, Mr. Delport had been too unwell to travel to America to receive the award and so the presentation was being made at that present session by Mr. Dietert, president of the AFS, whom Dr. Everest then invited to take over the ceremony.

After the citation had been made by Mr. Dietert, Mr. Delport briefly acknowledged the honour done to him, saying he had become AFS representative in 1927 to the International Committee and had attended 22 congresses and two special meetings. At all these, he had been impressed by the friendly atmospheres prevailing, without acrimony or propaganda and he had made many friends.

Final Speeches

It fell to the lot of Mr. E. Alander of the Finnish foundry association officially to welcome participants from the Congress who next day would be embarking on post-Congress tours of foundries in the four host countries, and he did this first in English, then French and German. Next, Dr. Schwietzke, also in three languages, officially thanked the hosts saying it had been a perfect Congress and gratitude was due to all who had collaborated in its organization and the hospitality accorded on so many occasions.

Finally, Mrs. Everest, saying that in this case it really was an honour for a lady to "have the last word," added thanks for her sex for all the Congress arrangements made for them, mentioning specially Mrs. Lagercrantz, Mrs. Lundqvist, Mrs. Villner, Mrs. Granström and the other members of the ladies' committees. On this note, the Congress was formally closed.

Although this was the end of the Congress business proper, it was not the end of the social side. On that evening (Friday), there was a concert of Scandinavian music arranged for delegates and ladies at the National Museum, Stockholm. It was well attended and most of the party later proceeded to the Mirror Hall of the Grand Hotel, for an informal "midnight" supper, followed by dancing. For those who next day did not depart for home or on independent tours, there was a delightful excursion to the island of Björkö situated in Lake Mälar, about 20 miles from Stockholm. For this trip, one party (seven coach loads) first went by road to Munsö. From here they were ferried to the island by the same steamer which had carried the second party all the way from the city to Björkö and left them there meanwhile. This island, in a highly picturesque setting, is the site of the town Birka which flourished as a most famous commercial centre during Viking times, more than 1,000 years ago, and there are many ancient ruins. After a most enjoyable stay and picnic lunch, the parties returned to Stockholm in the reverse manner to that of leaving, *i.e.*, the outwards coach party returned by water and the water-borne party by road; the organization of these dove-tailed arrangements was indeed excellent.

Post-Congress Tours

Quite a substantial number attending the Congress, many accompanied by their wives, subsequently left Stockholm to participate in both organized and unofficial post-Congress tours, mainly occupying about up to one week's duration. Table II has been prepared to illustrate the scope of the set tours, the names, sizes and nature of the foundries visited. The arrangements, however, were by no means restricted and a certain amount of latitude was permitted to the individuals who participated. In effect, the foundries concerned opened their doors on the dates specified to any Congress delegates who cared to go along and arranged for their reception and guidance, interpreters being in attendance as required.

Other Social Events

In conjunction with these post-Congress tours, in many cases the companies arranged special programmes, including outings, for the ladies accom-

*See last week's JOURNAL, page 272.

Stockholm Diary

panying the parties. In addition, the other host countries of the Congress held formal receptions to delegates visiting them on their own ground. For example, on Wednesday, August 28, a party of delegates was entertained by the Danish foundry associations (*Dansk Stoberiteknisk Forening* and *Foreningen af Danske Jernstoberier* in Copenhagen at *Jern-og Metalindustriens Sammenslutning*, and a most enjoyable evening resulted. On August 26, in Oslo at the restaurant Dronningen there was a reception by the *Norges Stöperitekniske Forening* and *Stoperiernes Landsforening*, followed by luncheon for those delegates who went to Norway. Later in the day there was also a civic reception in and tour of Oslo's Town Hall which was much appreciated. Yet a further item open to those visiting Norway was an organized inspection of the foundry (and affiliated industries') research centre at Blindern in Oslo. Not in any way outshone by the other host countries, Finnish founders, through their *Metallindustriförening*, took over the whole organization of the post-Congress tour in their country, from August 24 to 28, and arranged social events and ladies' excursions *en route*, including a civic reception in Helsinki. The delegates were led by Dr. Schwietzke, vice-president of the Committee at the receptions in Finland, and by Dr. Everest, president of the Committee in Norway and Denmark.

Return Journey

With such widespread participation in post-Congress tours both independently and on an organized basis, it followed that the UK party returning direct from Stockholm was considerably depleted. However, the IBF president (Mr. J. Blakiston) and Mrs. Blakiston led the IBF party also on the return journey to London. This was effected first by night train, leaving Stockholm at 9.30 p.m. on Sunday, August 25, arriving at Malmo in southern Sweden very early on Monday morning and thence by train ferry to the port of Copenhagen, entering the city in time for breakfast. After three hours' sightseeing in Denmark's capital, the party, now numbering only 14, entrained for Esbjerg on the west side of Denmark, reached in the early evening. Boarding the ss. Crown Prince Frederic, and setting sail immediately brought the party quickly under the influence of the heavy swell which had followed that weekend's gales and dignified retirement was effected quite early in the evening. The next day was fine and calmer and the rest of the journey to London, after landing at Harwich, was uneventful.

Acknowledgment

It speaks volumes for the organizing ability of the foundry associations and individual foundry members in the host countries—Norway, Sweden, Finland and Denmark—that all the vast arrangements of the Congress itself and the post-Congress tours all went through without any hitch and the thanks of all the delegates are due for the unfailing courtesy, generous hospitality and above all the friendliness displayed everywhere. On behalf of foundrymen from all the 27 nations attending, the writer therefore concludes with *Många Tack* (thanks a million!).

Research into Fatigue Fractures

Roughly nine out of ten of the accidents in the life of a machine are caused by fatigue breaks. Mechanical engineers therefore need to know, within close limits, the stress variations which occur in the life of a machine part. Since the amount of investigation needed to obtain this information, even for one machine, is enormous, the European Productivity Agency has initiated a programme of research in seven European countries, and Canada, to inquire into fatigue breakage, states *l'Equipement Mécanique*, August.

There will be 25 tension-compression vibrators, and 35 rotary-tension machines. Tests will be carried out on a light alloy, and two steels, a tempered one, and a heat-treated one. Metal for the test-pieces will come from three melts, of 20 tons each for the steels and 7.5 tons for the light alloy. From each melt, some 10,000 test-pieces will be made.

Test-pieces, after stress-reversal treatment will be tested to determine their Wöhler curve. This will define the damage done to a test-piece by the stress-reversals.

Non-ferrous Club

Resuming its series of luncheon meetings at the Queen's Hotel, Birmingham, last week, the Non-Ferrous Club heard an interesting talk on the Boy Scout movement by Mr. F. C. Rowe, A.C.C. for Scouts for the county of Warwickshire (who is also Midland area manager for Associated Lead Manufacturers, Limited). A collection taken on behalf of the Infantile Paralysis Fellowship, realized £13, 4s. 0d. for this charity.

EFCO and New Metallurgical Fields

Atomic power and supersonic speeds have opened an entirely new field of metallurgy in which many types of electric furnace are essential for the production of the new metals on which these developments depend, states Mr. D. F. Campbell, chairman of Efco, Limited, London, S.W.1, in his annual review.

The engineer was dependent upon the metallurgist for new materials to stand the stresses and temperatures hitherto unknown in engineering practice. Efco-Edwards Vacuum Metallurgy, Limited, had been formed to combine knowledge and skill in the field of melting and heat-treatment of steel and other metals by processes which were bound to be applied to an ever-increasing extent in the "new machinery." Arrangements had recently been made for technical collaboration with the leading arc-furnace makers in the US, Germany, and France. Work in hand of the Efco Group was higher in value and volume at the end of the financial year than in any previous year.

Turnover Expansion for 600 Group

Expansion by about 25 per cent. in the turnover of the George Cohen 600 Group, Limited, for the year ended March 31 last, is reported by the chairman, Mr. Cyril Michael Cohen, in his annual statement. Turnover increased to £32,000,000 and a substantial part of the rise was attributed to Dunlop & Ranken, Limited. In the aggregate, however, there was a real increase in the productivity of other companies in the group.

Latest Foundry Statistics

The following is a detailed commentary by the Joint Iron Council on the Iron and Steel Board's announcement of iron castings production in the second quarter of 1957.

Total Output

The production of iron castings in the second quarter of 1957 at 944,500 tons was 2 per cent. lower than in the previous quarter and 7½ per cent. below production for the second quarter of 1956. Details of sectional output for 1956/1957 are given in Table I.

TABLE I.—*Production of Iron Castings, by Sections.*

Section (grey and malleable iron castings).	Second quarter.		Percentage change.
	1956.	1957.	
	Tons.	Tons.	
Automobile (including tractors) ..	124,800	132,100	+ 5.8
Engineering[1]	378,800	334,000	−11.8
Building and domestic	140,900	142,300	+ 1.0
Pressure pipes[2] and malleable-tube fittings	183,400	139,100	−24.2
Ingot moulds[3]	114,000	108,800	− 4.6
Railway equipment	80,100	88,200	+10.1
Total	1,022,000	944,500	− 7.6

[1] Including machine-tool, textile machinery, electrical, shipbuilding etc. [2] Mainly gas and water. [3] Mainly for the steel industry.

The further fall in production is mainly due to difficult trading conditions in the pressure-pipe and in some general-engineering sections of the industry. In the automobile, building, and railway-equipment sections, output exceeded that of the second quarter of 1956.

Raw Materials

The ironfounding industry's consumption of its principal raw materials is shown in Table II, and Table III gives the production of iron castings by districts.

TABLE II.—*Pig-iron and Scrap Consumption by Foundries.*

	Second quarter.		Percentage change.
	1956.	1957.	
	Tons.	Tons.	
Pig-iron (including refined iron) ..	627,300	546,500	−12.9
Scrap (about half is foundry circulating scrap)	804,100	789,300	− 1.8

TABLE III.—*Production of Iron Castings, by District.*

District.	Iron castings (tons).	
	Second quarter, 1956.	Second quarter, 1957.
North East	81,390	72,610
North West	138,080	127,360
Yorkshire	109,810	106,860
East Midlands	201,840	166,960
West Midlands	191,420	188,390
Eastern Counties	39,340	35,290
Southern Counties	81,100	81,590
Scotland and Northern Ireland ..	110,160	105,580
Wales	68,900	59,820
Total	1,022,040	944,460

Labour

The number employed in the ironfounding industry at June 29, 1957, was 137,800—a reduction of 0.5 per cent. in the labour force from the level of 138,500 which obtained at the end of March, 1957.

Research on Fires

It is characteristic of the age in which we live, that everything becomes more expensive, and fires are no exception. *Fire Research 1956**, recently published, states that since 1930 the cost of large fires (those involving losses of £10,000 or more) has increased 2½ times. This has been shown to be due to the changing value of money rather than to more numerous or larger fires. When the cost is related to prices current in 1949 it is apparent that the real fire losses in post-war years have been somewhat less than before the war.

This is the tenth annual report. In their review of the work of the Fire Research Station, the board note that their work will now be entering a phase in which it should increasingly provide information that will be useful in design of new buildings, in improved codes of practice, and in fire prevention. A start has been made with experiments on the construction of the outer surfaces of multi-storey buildings and on the provision of escape staircases.

Fire Detection

The study of large fires has emphasized the importance of early detection. There has long been a need for a standard test to assess the performance of fire detectors, and particularly for a test that can be related to actual fire conditions. After measuring temperature and speed of gases above a number of fires a small wind-tunnel has been constructed that will reproduce the conditions found in practice. Other tests have been developed to measure resistance to corrosion, and to examine the effect of the various forms of vibration to which a detector can be subjected in industrial premises.

Fires in Industry

The Station has continued its work to assist the Factory Department of the Ministry of Labour and National Service. Arrangements with the Safety in Mines Research Establishment of the Ministry of Power for work on dust explosions have also continued, and during the year 64 materials ranging from para nitro-ortho-toluidine to icing sugar have been examined to determine their explosion hazard.

It is now nearly 150 years since Davy invented the safety lamp, and the principle has since been extended in the development of equipment to suppress flames and explosions in industrial plant. There is, however, a lack of fundamental information required for the designing of appropriate protection with many of the materials. With equipment now being used in industry, and at the request of the Factory Department, research has been started to obtain further basic information so that protection may be planned scientifically over a much wider field.

* *Fire Research*, 1956, published by HMSO for the Department of Scientific and Industrial Research; price 4s. 3d., post free.

Restrictive Trading Agreements

Included in the second list of agreements which the Registrar of Restrictive Trading Agreements has been directed to refer to the restrictive practices court are the following:—

Agricultural machinery and parts and dairy machinery; electrical fractional horsepower motors (not below 1/20th h.p.); electrical transformers; engineers' small tools; hand tools; industrial furnaces; pumps and pumping plant; road rollers; and water-tube boilers intended to be installed on land.

Company News

ALFRED HERBERT, LIMITED—Interim dividend of 4 per cent., tax free, compared with 2½ per cent. last year, when the tax-free total was 7½ per cent.

CHAS. CARR, LIMITED, non-ferrous founders, of Smethwick (Staffs)—Net profit for the year to June 30, 1957, is £13,626 (£17,905) and the dividend is 25 per cent. (same).

PETRIE & MCNAUGHT, LIMITED, textile engineers and ironfounders, of Rochdale—Trading profit in the year to April 30, 1957, is £95,107 (£77,072). A final dividend of 2½ per cent. makes 12½ (10) per cent.

CROFTS ENGINEERS (HOLDINGS), LIMITED—The company has declared an interim dividend of 6¼ per cent. on the £2,000,000 ordinary for 1957. This compares with 5 per cent., the 1956 total being 12½ per cent.

JAMES BOOTH & COMPANY, LIMITED, non-ferrous metal manufacturers, etc., of Birmingham—The company announces an interim ordinary dividend of 5 per cent. For 1956 a single dividend of 12 per cent. was paid.

JESSHOPE HOLDINGS, LIMITED, engineers and ironfounders, etc., of Stoke-on-Trent—Group trading profit in the year to June 30, 1957, is £60,512 (£60,041), and profit after tax is £27,104 (£26,745). The dividend is maintained at 15 per cent.

CRAVEN BROS. (MANCHESTER), LIMITED, machine-tool manufacturers, of Stockport—The company is halving the interim on its £700,000 ordinary with a declaration of 2½ per cent. for 1957. The total for 1956 was 10 per cent., compared with 17½ per cent. in the preceding year.

WILLIAM JACKS & COMPANY, LIMITED, metal and alloy merchants and importers, etc., of London, E.C.2—Trading profits advanced to £366,191 (£294,315), and after tax of £172,767 (£142,600) net profits rose to £165,548 (£130,676). The ordinary dividend is 20 per cent. (same), plus a distribution of 2½ per cent. (nil) out of capital reserve.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED—Group profit before depreciation and tax was £6,760,000 (£7,320,000) for the first half of 1957. After increased depreciation the net trading profit was £5,000,000 (£5,930,000). Orders increased by £17,600,000 to £84,500,000 in the first half of 1957. A second interim dividend of 2½ per cent., making 5 per cent. to date on the £33,639,483 ordinary stock, will be paid to holders registered on September 3.

SHEEPBRIDGE ENGINEERING, LIMITED—The group's profit and output for the first four months of the current year are not so high as in the corresponding period last year, nor is the order-book so full as a year ago, but all figures have been showing a steady and continuing improvement since early in 1957, states Mr. A. V. Nicolle, chairman. Group trading profit was £1,286,092 (£1,294,836). Net profit after tax and depreciation was £394,722 (£518,788), and the dividend is 15 per cent. on the reorganized capital.

CLIMAX ROCK DRILL & ENGINEERING WORKS, LIMITED—While selling prices were increased in the year to March 31, 1957, additional costs could not be wholly passed on—particularly in the export markets—and this, with further rising costs, reduced the profit margin available. Group manufacturing and trading profits declined from £140,700 to £126,818. Net profit was £38,397 (£51,053) and the dividend is 7½ per cent. (same). Holman Brothers intends to make an offer for the ordinary capital not already owned by that company.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

777,329. Mo Och Domsjo AB., Ornskoldsvik, Sweden.

Binders for foundry purposes which utilize a core-sand composition mentioned in a previous patent, No. 754,823, admixed optionally with a minor proportion of soot, by volume, as a sand-moulding composition.

777,354. British Iron and Steel Research Association, 11, Park Lane, London, W.1, and J. S. Morton, 161, Queens Road, Weybridge, Surrey.

The indication or regulation of liquid levels in containers. The chief application of this invention is in the continuous casting of metals.

777,565. Richard Jonke, 8, Rue Allouard, Vaucresson (Seine et Oise), and Joseph Lintner, 25, Avenue des Bruyeres, La Garenne-Colombes (Seine), France.

Process for the manufacture by the galvano-plastic method of parts and components subjected to static and thermal stresses, and particularly of moulds. The process is useful for making moulds for pressure or injection moulding of metals, and for centrifugal-casting methods.

777,703. Bristol Aero-Engines, Limited, Stonebridge House, Colston Avenue, Bristol, 1.

Improvements in the methods for the heat-treatment of Nimonic alloys.

777,815. Dow Chemical Company, Midland, Michigan, USA.

Method and apparatus for the manufacture of galvanic anodes for use in the cathodic protection of metallic surfaces. These anodes are directly chill cast around an electrically-conductive core member which is fed through the bottomless chill-casting mould at the same linear rate as that at which the casting is produced.

777,987. Metropolitan-Vickers Electrical Company, Limited, St. Paul's Corner, St. Paul's Churchyard, London, E.C.4.

A process for the production of grey cast-iron which involves the addition to molten cast-iron of the products of reacting magnesium metal with a cerium halide (cerium chloride). The cast-iron will have improved mechanical properties, especially high-tensile strength and resistance to shock.

778,000. Mercast Corporation, 295 Madison Avenue, New York, 17, NY, USA.

This invention is based on a discovery which makes is possible to overcome the limitations previously encountered in shell moulds produced in accordance with FIAT final report, No. 1168, dated May 30, 1947. Now, much superior shell-mould sections can be made which may be joined into an integral thin-wall, porous, composite mould structure for use in casting critical metal parts with tolerances as high as 0·005 in. per in.

The individual shell-mould sections are formed with an investment material which combines a predominant amount of refractory particles with a critical amount of an organo thermosetting resin and also of an inorganic high-temperature binder which is rendered effective—after first forming the individual self-supporting mould sections by heat-treatment which sets the resin binder—by assembling the mould sections into the composite complete mould and heating the assembly to between 500 and 1,300 deg. C. The high-temperature binder binds the refractory particles of the individual mould surfaces and also along the mating surfaces of the individual sections.

Protection and Preparation of Casting Surfaces

By Van der Bruggen

In all branches of engineering production, and particularly in machine shops, the cleaning of surfaces adds considerable costs to the processes involved. It can be stated that, in general, insufficient attention is given to this problem by the founder. This Paper outlines the nature and causes of surface contamination and gives particulars of remedial measures that could be applied, together with details of various protections that can be employed to prevent the initial corrosion and adulteration of metallic surfaces. The Author concludes with tabulated characteristics of coatings that are required for specified protection in general use.

The cost of surface cleaning, which should be kept as low as possible, will vary from one works to another as the extent of contamination of the surfaces will depend upon the type of manufacture carried, the condition of the surfaces, and the distance travelled by the castings during production.

Nature and Causes of Surface Contamination

The following sources of dirt and contamination may be expected in engineering workshops: (*a*) Rusty castings from the foundry (unprotected storage after casting, or lack of protection in transit); (*b*) rusting due to weathering (open storage); (*c*) rusting under cover (long storage under a roof, or in spaces affording no protection against atmospheric humidity); (*d*) rusting during transit of the castings (long or unprotected stockpiling between machining operations); (*e*) dust deposits on the surfaces (during storage near the foundry or fettling shop); (*f*) dust deposits on the surfaces (from fettling operations or rust removal in a confined shop); (*g*) dust deposits on the surfaces (during fabrication, machining and intermediate phases, by workshop dirt, metallic dust and rust particles); (*h*) residues on the work surface (*e.g.* marking-off), principally of limewash; (*i*) residues on the surface due to evaporation of coolants and machining sludges) and (*j*) residues on the surface (oil, grease and sweat from machining).

Surfaces of machined castings sent to the paintshop, usually require combined mechanical and chemical cleansing, the cost of which will be in direct relationship to the degree of contamination of the surface. This not only affects the operation of the paintshop, but, in addition, the undesirable consequences of surface contamination will be felt in various sections of the production line. Shops which omit to take steps to keep castings clean, or to protect them, may expect to encounter the following drawbacks:

Cleaning Difficulties: Increased dust when cleaning off, accompanied by bad visibility and subsequent decrease in output, together with contamination of the atmosphere, possibly accompanied by respiratory troubles.

Trouble in Marking-off Surfaces: Bad adhesion of the marking colour (limewash) on dusty surfaces, which also partially absorb the colour and affect the tone.

* Translated and abstracted from a paper appearing in *Werkstoffe u. Korrosion*, 6 (5) pp. 223–227.

Machinery Troubles: Contamination of machinery and castings, particularly by dust; increased dirt in the workshops, influenced by the number of castings and machines, with the subsequent increased outlay for ventilation, air purification and heating. Bad contrast between the tool and the casting is also caused, resulting in decreased production; further there will be impaired accuracy and ease of handling, compared with an even-coloured, contrasting marked surface, and finally, unfavourable psychological effects, due to dirt and disorder.

Paintshop Difficulties: Greater loss of time as well as increased expenditure for rust removal, degreasing and washing, with, usually, unsatisfactory results in the paintshop are the main consequences of dirty castings. Since cleaning at this stage is usually effected by hand, the castings having been machined, the application of rational cleaning methods is no longer possible, and the lack of continuous and careful inspection control can lead to impaired adhesion of the ground coat with a subsequent reduction in the quality of the final application.

Protective Coatings

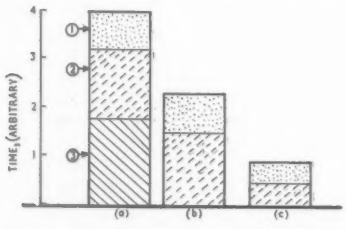
In normal production, there are two kinds of paint or lacquer finishing applied after machining, depending upon the nature of the product, these are:— (*a*) Parts and machines receiving several different coats of paint or enamel finish, *e.g.* most machine tools and machines for the foodstuffs industry, and (*b*) tools and utensils which usually receive only one or two coats of paint or enamel, and are not treated with a filler or ground coat, *e.g.* textile and woodworking machinery. The advantages and disadvantages of surface cleansing, as well as surface protection by paint, in relation to time and performance on examples representing each of the groups of machinery types (*a*) and (*b*) are as follow:—

(*a*) *Machine Tools*

Fig. 1 shows the time spent on cleaning a badly-rusted casting which had not been protected during storage and machining; it can be seen that a considerable time economy was obtained when the casting received an early priming or ground coating. Such a surface enters the paintshop free from rust, *i.e.* rust has been removed during machining, and whatever dirt is present is purely superficial, since casting pores and/or casting surface irregularities have been partly filled by the priming coat.

Protection and Preparation of Casting Surfaces

Fig. 2 shows the flow sheet for a casting which, as frequently happens, passed through the whole fabrication process without any steps being taken to protect its surface (by painting), and received its first surface treatment, *e.g.* cleansing and rust removal in the paintshop. The required thorough cleaning which alone can produce the chemically and mechanically clean, metallic surface which is essential for the proper adhesion (keying) of the



(1) priming coat; (2) cleaning, and (3) de-rusting.

FIG. 1.—*Difference in time taken for cleaning and protecting castings with varying degrees of contamination: (a) Surface rusty and soiled (cleaned by hand and paint applied by brushing); (b) surface and pores contaminated by dust, soda and oil (cleaned by hand and paint application by brushing); (c) dusty surface caused by atmospheric pollution from fettling (cleaned by washing, painting effected by spraying or dipping).*

first priming or ground coating, and thus for all further coats of paint or enamel, is difficult to apply at this point in the production line. The bright metal surfaces frequently prohibit rational application of the methods available at this stage, even if cleaning is effected satisfactorily; the painting costs are always greatly increased by the manual cleaning necessitated.

Fig. 3 shows the sequence of another casting, in which case, however, in addition to rough cleaning, a priming coat had been applied immediately on despatch from the foundry. When this casting reached the paintshop, it was cleaned by wiping or washing, and any bad patches in the ground coating, possibly resulting from the preceding machining operations, were repaired.

In the case of long production lines, and intensive mechanical working of the castings, a renewal of the surface coating may become necessary (*e.g.* if the primed casting is left for any length of time before machining, or if it is exposed, during machining, to appreciable chemical influences or mechanical damage). Stockpiling is not often carried out under cover, and the expenditure in repairing the priming coat is usually considerably less than the cost of cleaning a heavily contaminated, and partially rusty surface, as can be seen by comparison with the times plotted in Fig. 1.

Fig. 4 shows the arrangement for the surface cleaning of castings by fettling and priming. The combination of these is advantageous, although the layout and scope of such an installation can vary greatly, according to circumstance. Usually, if the castings are delivered free from rust, shotblasting can be omitted, unless other castings, to be handled simultaneously, carry considerable deposits of rust or scale. This arrangement, in which cleaning is effected before the castings are stockpiled, also speeds throughput of work since, frequently, the entire surfaces are quite needlessly cleaned, merely because some visible rust patches have to be removed.

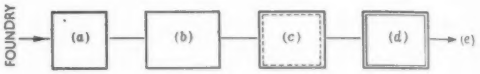


FIG. 2.—*Flow sheet for a casting passed through various processes without protection: (a) Casting store; (b) machining, cleaning and storage; (c) cleaning (degreasing and derusting); (d) application of primary coat; (e) paint or final coat applied. (a) and (b) lead to intense contamination of pores in the casting, whilst (c) and (d) are operations usually done by hand, with considerable expenditure of time, resulting in increased costs.*

The paint application (priming coat) can, in this case almost without exception, be performed by spraying or dipping (*i.e.* in the most rational manner possible). The preference for either method is determined by particular factors, such as the shape and size of castings, and whether internal or only external treatment is required. Dipping or spraying, in the latter case with adequate paint pressure, can produce, on a properly cleaned surface, just as good adhesion of the paint coating as hand-brushing. Furthermore, experience, particularly during the war years, when the custom of stockpiling castings for thorough weathering had to be abandoned, has shown that long storage is unnecessary and that in weathering castings, temperature fluctuations may play a part but rusting has no effect whatsoever. As a general rule, therefore, most castings can be weathered under cover, for shorter periods, without detriment.

Textile Machinery

Fig. 5 shows the time expended on cleaning the smaller cast components of a textile loom, which

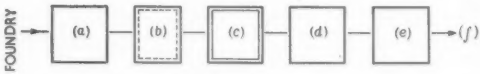


FIG. 3.—*Flow diagram for a casting which is protected from contamination by a primary coating applied early in the processing: (a) Rough fettling; (b) cleaning; (c) application of primary coat; (d) storage; (e) machining, and (f) final painting or varnishing. It should be noted that the superficial contamination occurring at stages (d) and (e) can easily be removed by wiping or washing.*

are not usually treated with a filler. A mechanical cleaning process cannot be applied to the parts

at this stage, as they have been machined, drilled and milled, etc., to close tolerances. Consequently, only cleaning by hand is possible, the difference being that these small parts, as opposed to larger castings, usually reach the paintshop with only slight and partial rusting. The castings often rub against each other while in transit, in boxes or bins, and rust is also removed by handling (*e.g.* in clamping in the various machine tools). Where this is not the case, the removal of rust by hand can cause difficulty owing to the small size of the components.

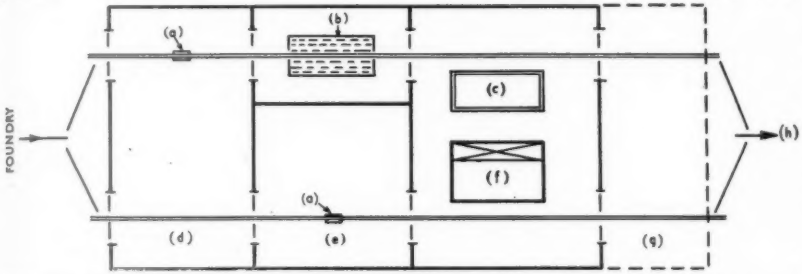
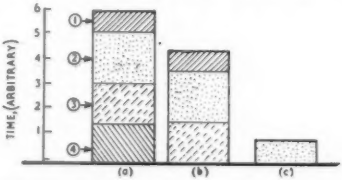


FIG. 4.—*Typical flow sheet for the processes of cleaning and protection.*

(*a*) Crane or transport facilities; (*b*) shotblasting; (*c*) dipping; (*d*) enclosed and heated storage; (*e*) fettling; (*f*) spray shop; (*g*) covered stockpile, and (*h*) despatch.

There is little opportunity for cleansing or degreasing by dipping, and this process is not always suitable since, if aqueous solutions are used, subsequent rusting is possible, particularly in holes and recesses. When organic solvents are used, it is necessary in most cases to grease the machined areas which, if unprotected, are sensitive to moisture.

Fig. 6 shows the production sequence for small castings. In the enamelling of small parts, cleansing must be followed by a rather tedious application of the coating. For similar reasons, application must be effected by brush or spray gun, for despite the otherwise favourable shape and size of these small castings, dipping is seldom suitable, as even in hand spraying, it is necessary to shield the machined faces. Finally, "cleaning-up" is usually necessary, since the shielding employed is seldom



(1) Grinding; (2) primary coat applied; (3) surface cleaning, and (4) rust removal.

FIG. 5.—*Comparisons of times expended on cleaning and painting four different contaminations of small castings: (a) Surface rusty and soiled; (b) soiled, and (c) clean surface. In the case of (a) and (b), cleaning is carried out by hand, and priming by brushing, whilst in the case of surface (c), paint application is by spraying or dipping.*

completely efficient. Thus, even in this sequence, the labour cost in the paintshop remains high.

Fig. 7 shows a sequence for similar small castings, which, however, have been painted at an earlier stage; provided that clean castings are supplied (which can be ensured by proper protection in transit) no surface cleaning is required. The paint coating can be applied by dipping or washing, machined surfaces being protected throughout (*viz.* in the castings store, during fabrication and in intermediate storage).

Since most loom parts are not filler treated, the paintshop can be transferred, as shown in the production flow sheet in Fig. 7, to a site adjacent to the delivery bay. The second, and usually final coat, is applied after assembly and ensuing inspection test (*i.e.* on the finished machine). This finishing process may entail extensive repair to damage suffered by the first coat, during progress through

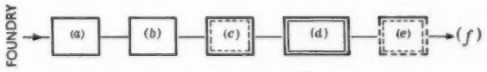


FIG. 6.—*Flow diagram for small castings for use in the textile trade: (a) fettling (frequently rust, also soda and oil from machining processes is removed); (b) storage or machining; (c) cleaning, either degreasing or derusting; (d) painting, either brushing or spraying, after shielding; (e) cleaning surplus paint from machined faces, and (f) parts to assembly.*

the processing stages. This damage does not only occur during actual machining operations, but may, to a great extent, take place in intermediate stock-

FIG. 7.—*Flow sequence for small castings, painted at an early stage in the processing: (a) fettling; (b) cleaning (usually unnecessary); (c) painting, by dipping or flooding; (d) storage or machining (e) parts to assembly.*

piling; in transit; during assembly; and in the first tests of the assembled machine. If the first coat of paint is applied after machining, as shown in Fig. 6, a final coat on the assembled machine becomes a necessity, the amount of work required varying

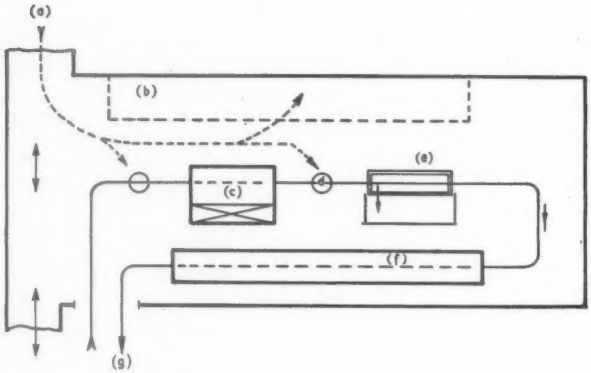


FIG. 8.—*Schematic representation of the flow system for the processing of small castings for use in the textile industry.*

(*a*) incoming castings, from fettling; (*b*) stockpile; (*c*) paint nop—spraying; (*d*) hoists and conveyors; (*e*) dipping tank; (*f*) drying, or stoving tunnel, and (*g*) final storage.

TABLE I.—*Factors Influencing the Choice of Protective Coatings.*

Characteristics required.	Influencing Factors.
Resistance in storage	Type of storage (open or under cover); air humidity; temperature; temperature fluctuations and surrounding conditions.
Resistance to impact—elasticity	Extent of machining (sq. in. per item); number of tool settings; means of conveyance (separately or in bins), and transit periods (daily or weekly, etc.)
Heat resistance	Working temperatures in machining or use.
Hardness	Suitability for marking off, or priming.
Colour tone	To contrast with tool colour; as ground-coating, or to match the finishing coat.
Chemical stability	Soda solutions (coolant); oil or grease concentrations, and duration of exposure.
Colour pigments	Tool-steel type; cutting speeds; and life before grinding or sharpening.
Binders (vehicles)	Percentage of surface to be abraded.
Drying time and temperature	Size, weight and shape of parts; whether air-drying, accelerated drying or stoving is practised.
Ease of application	Whether by spraying, flooding (washing) or tumbling.
Solubility	Solubility (adhesion or keying) in relation to subsequent coating.

according to the damage suffered by the first coat. It will be seen that the extent of the damage to the first coat during the processing, has little effect on the scope and cost of the second coating of the completed product.

Fig. 8 shows a painting installation for small castings, which in this case is located next to the factory's own foundry, and from which the parts are transferred mechanically to the castings and despatch store. According to the nature, shape, and size of the parts received, dipping washing or spraying can be employed. Heavier parts received in smaller numbers, *e.g.* machine pedestals, can be mechanically hoisted into the conveyor. The most suitable paint is selected according to the variable requirement.

Table I gives information on a number of factors to be considered when selecting the ground or final coating to be applied to a casting before stockpiling or assembly, or after final assembly.

BRITISH TIMKEN, LIMITED—Mr. Richard L. Frederick of the US has been appointed a director. Mr. W. R. Timken has resigned from the board owing to pressure of business in the US.

A. V. Roe (Canada) Issue Oversubscribed

Public offering of 40,000 shares of A. V. Roe (Canada), Limited, 5¼ per cent. convertible preferred stock at $100 par value has been oversubscribed and the books closed. This was part of a $24,000,000 offering. The remainder of the shares were taken up by Hawker Siddeley through its subsidiary, Racair, Limited. The purpose of the issue is to help finance a plan to acquire the Dominion Steel & Coal Corporation, Limited.

Two directors of Dosco have written to shareholders indicating their intention to fight the sale of the company on the grounds that the price offered is too low. Mr. C. B. Lang, president of Dosco, has been asked for a special general meeting of shareholders to consider the offer and to hear their views.

Dosco's new furnace has been producing up to 228 tons of molten steel in a 7½-hour shift since its installation in June, it is reported. Mr. C. Murray, general superintendent of Dominion Iron & Steel, a Dosco subsidiary, said that the new furnace will bring steel production up to 1,000,000 tons annually.

Wolfram Price Effects Murex Results

Trading results of an otherwise satisfactory year were adversely affected by the continuous decline in the world price of wolfram, states Sir Arthur Smout, chairman of Murex, Limited, metallurgists, etc., of Rainham (Essex), in his annual review. This resulted in heavy losses on turnover of stocks, accentuated by a falling off in the demand for tungsten products in their various forms.

The new plant to be erected at Rainham for the production of pure tantalum and niobium powders is scheduled to come into production in 1959 and should be able to meet foreseeable user requirements. The directors authorized during the year capital expenditure of £915,000, and £500,000 has been spent on new fixed assets. If the company is to carry out its long-term programme, money will be needed for investment in the business, and Sir Arthur adds that it may be necessary to seek additional capital.

The dividend is maintained at 20 per cent. and group fixed assets have risen from £2,079,746 to £2,365,805, but current assets are down from £6,278,465 to £5,752,337.

Control of Cupola Gases

By W. Y. Buchanan, F.I.M.

Few foundry managers who have been recently visited by the British Cast Iron Research Association's Foundry-atmosphere's team will have escaped some purposeful prodding intended to make them give serious consideration to improving the atmosphere of the cupola-charging platform, and the Author is no exception. While it is true that carbon monoxide when present in very low concentration can prove fatal, and there are few furnacemen who have not had dizzy spells, the common response in most cases to questions on this subject are that "nobody has died as yet," and that "if the gas is blowing down badly to-day, the weather may quite well change for the better to-morrow." Some furnaces are, of course, better located than others in respect of liability to accumulations of toxic gas, but all of them have their bad spells.

The Author recently built a small furnace in what was otherwise a very convenient location only to find that with the furnace top level with the roof gutter, a violent downdraught was directed into the stack by a nearby tall building, according to the prevailing wind. The conditions then were not the subject of mild objection but became totally insufferable. Quite a number of expedients to cure the trouble were tried, with varying degrees of success, but provided no real remedy. The commonly suggested addition of an extra 20-ft. to the height of the stack so as to produce sufficient natural draught was not a very attractive proposition for a large number of reasons.

Positive Action

Normally, a suction fan on the top of a cupola would, owing to the high temperature of the gases, be quite impracticable; however, now that water-spray spark-arrestors are very common, a fan becomes a possibility under the circumstances, and in fact has been applied in the Author's case, to give complete satisfaction (Fig. 1). There is, of course, no question as to its effectiveness, the only problem being that of keeping it going after the first day.

Method of Operation

The method of operation is now very simple, as follows:

(1) When the furnace is being lighted, the manhole on the top is closed and a steel shutter is used to close the charging door. In this way, the coke bed is burned through very rapidly, thus considerably reducing the lighting-up time—say from 2 hours to 25 min. At this stage, the smoke and fumes from the wood fire are taken up quite independent of the weather, and the exit stream can be seen rising as high as 40 ft., on a calm day.

(2) During the charging time, the suction fan operates, with the charging door open, and this keeps a draught of fresh air going into the furnace.

(3) When the main blower is switched on to commence melting and a flame begins to appear through the top charges, the exit-gas temperature is inclined to rise, and at this stage the maphole cover at the top of the furnace is open sufficient to dilute the exit gases with cold air.

(4) The exit-gas temperature, during the time that the furnace is reasonably full is not troublesome, and during the blowing down period does not exceed 370 deg. C. Holes drilled in the fan casing or in the short duct between the fan and the furnace top, serve to give a permanent dilution

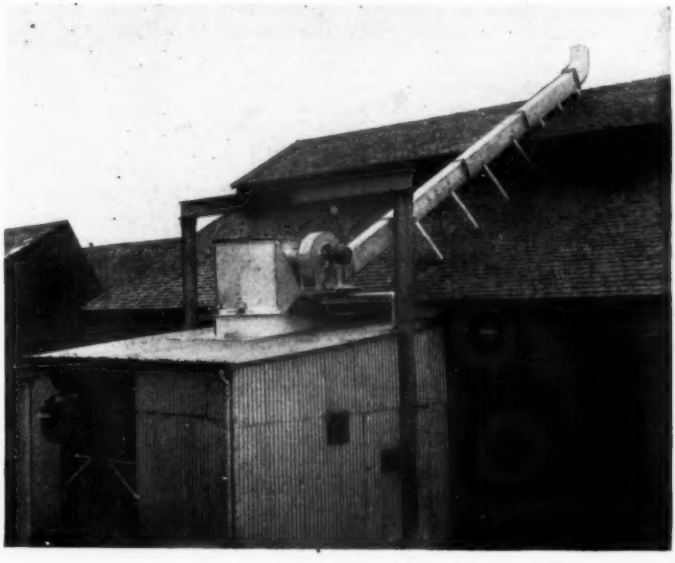


FIG. 1.—*Extension to the cupola's wet spark-arrestor, with a fan built on to it and the fan exit carried to the highest part of the foundry roof. The velocity of gases leaving the ducting is so high that they are blown completely clear of any swirling currents caused by the contour of nearby buildings.*

Control of Cupola Gases

where the cold air is most effective. This line of action amounts to little more than applied commonsense.

Gas Removal

As regards the removal of gas, the success of the apparatus is quite remarkable. However, there are other, and probably more important benefits which were not anticipated and these are probably quite as interesting to foundrymen generally, as they are outside the scope of mere improvement in working conditions and enter into the realm of economic advantages. Thus, the improved method of lighting-up, besides being quicker, makes the cupola quite independent of changes in weather conditions, atmospheric pressure, humidity, etc., and the furnace can also be operated with a very low stack which is an economy in first cost and in brick lining, etc. It is well known that no matter how scientifically a furnace may be constructed, its daily performance is very seriously limited by the condition of the lighted bed before charging, particularly when short melts are envisaged. In the example cited, it has been proved that the melting rate is increased by 10 per cent. This fact alone indicates the very marked improvement in metal condition, particularly for the production of light-section castings. There is the added advantage, of course, that the idea may be developed further as the demands for clean air become more fashionable.

Ancient Britons made Steel

Although Julius Cæsar in his "*De Bello Gallico*" speaks of the ancient Britons as using iron only as money, there is no doubt that the art of making iron was well advanced in Britain, as later the Romans found to their cost. Cæsar saw only a little of southern Britain on his expeditions which, indeed, were more in the nature of raids. The contact of, at least, the southern Britains with Gaul was intimate and both Strabo and Cæsar tell us of the Gauls: "They have great iron works and every kind of mine." There is no doubt that the great scythe-like knives attached to the hubs of the chariot wheels of Cassivelaunus and of Boadicea were of steel or at least of a steel-like wrought-iron produced perhaps in the primitive "bloomeries" of Sussex and the Forest of Dean.

This fact is borne out by the discovery in recent years at Llyn Cerris Bach (The Lake of the Little Stones) in western Anglesey of the segments of *steel* tyres of chariots made, it is estimated, round about 100 B.C. to A.D. 50. They are of steel without question as they contain about 0.75 per cent. of carbon and have the qualities of ductility and hardness characteristic of steel. In the early bloomeries such an absorption of carbon into the ductile "bloom" was obviously possible and no doubt, ultimately predetermined so that steel-like iron, at least would be the result.

Iron has been an article of common use in Britain from at least about 500 B.C. and the knowledge of how to make it came with the migrating Celtic tribes from the Rhineland and Saxony.

The analysis of the Anglesey iron showed that carbon was present from 0.74 to .0.95 per cent. with less than 0.05 per cent. of silicon. The analysis also suggests that manganese iron-ores containing little sulphur and phosphorus were used and made this steel-like iron a possible product of a primitive "bloomery," especially if, as no doubt was discovered, the air was blown in so as not to reach the centre of the hearth and the "bloom" kept in the furnace longer than required for wrought iron. Less air and longer cooking saved that essential bit of carbon from being oxydized by the blast—hence a steel was the result.

Super-refractory for Furnace Roofs

Experiment With Costly Chrome-Magnesite Basic Material

An essentially chrome-magnesite basic material known as Electrocast 104, used for many years in the glass industry as melting-tank lining, is being tried in an open-hearth roof by Republic Steel Corp., according to C. W. Cravens in a communication to the American Institute of Metallurgical Engineers at Pittsburgh recently, reported in *Steel*, April 29. As the name implies, it is melted in an electric furnace and cast into billets which are diamond sawn into furnace shapes. The cost is high, being as much as ten times that of conventional basic brick and this appears to be the reason for its being kept out of the open-hearth roof. Previous steelmaking trials with it have been confined to electric furnace hearths and the open-hearth slag line. Despite cost, the exceptionally high density and compressive strength achieved by this type material at high temperatures were considered by Republic to be good reasons for a trial. The first test was made in 1955, when seven rings were installed in the centre section of a silica open-hearth roof. After 200 heats, the furnace went down due to failure of the silica portion of the roof. During the campaign, it was necessary to repair the silica sections three times but not the Electrocast rings.

Several further trials with zebra, checkerboard and panel roof patterns showed roof life to be much limited by the silica portions. Combinations of Electrocast and metal-encased basic brick, in which the Electrocast section reached 299 heats before rebuild, suggested a roof constructed entirely of the cast material. Such a roof the author points out, installed at a cost $3,000 more than the previous rebuild, will need to last 388 heats to prove economical through decreased delays and increased tonnage. At 75 heats he states, it showed some roughness but no need for patching.

STANDARD RANGE & FOUNDRY COMPANY, LIMITED—Mr. T. E. Marshment and Mr. R. Joliffe have been appointed executive directors.

Book Review

Steelplant Refractories, by J. H. Chesters. Published by the United Steel Companies, Limited, 17, Westbourne Road, Sheffield, 10; price £4 (or $12 in USA).

It is just forty years since the first book in this country devoted to the subject of refractories—Searle's "Refractory Materials, their Manufacture and Uses"—made its appearance. Then (in 1917) the UK was producing less than 10 million tons of steel annually; now it produces over 20 million tons. In this doubling of output, refractories have played an important, though badly-documented part, British makers of refractories having been decidedly reticent about making their achievements known. Searle paints a gloomy picture of the 1914-18 days when, largely due to the "apathy of British refractories manufacturers," Continental competitors were turning out refractories having superior performances from raw materials much poorer than those then being used in the United Kingdom. Nowadays, British refractories producers can hold their own against virtually all comers and, since the producers seem unwilling to do it for themselves, it is pleasant to find a user of most of their products putting on record in this book the significant advances that have been made in the refractories field in recent years.

Dr. Chesters' book, the second edition of an original produced in 1944 under the stress of war-time conditions, is essentially a record of progress and achievement. As in the first edition, he writes in a very easy style, with words carefully chosen to convey some of his undoubted enthusiasm to the reader. The less successful ventures of the refractories producer have scant mention in this book. The author has mapped out "peaks" of achievement in refractories technology and used these as a framework upon which to build the structure of the book. Current achievements alone are not enough, the author is constantly looking ahead; almost every section in that part of the book dealing with applications is concluded with a paragraph in which Dr. Chesters suggests lines of improvement and possible future development.

Whilst this "dwelling amongst the peaks" gives the book a pleasing perspective and lightens considerably the task of the general reader, it is perhaps inevitable that the specialist should find, in some of the detail present, certain regions of dissatisfaction. Without going into details, it may be said that the present reviewer found several places and several topics where the treatment was sketchy and lacking precision, particularly in the relationship of practical to fundamental knowledge; thus it is possible for Dr. Chesters to pose himself a practical question on one page and, unknowingly, to produce a partial answer by a reference to a more theoretical paper a few pages further on!

These considerations are not likely to trouble the practical foundry steelmelter greatly, nor do they detract from the value of the book for him. This book fills such an important gap and does it in so attractive a way that it seems bound to become a "best seller" and to make many friends in the foundry industry, as in many other fields.

What shall a reviewer say to those already familiar with the original (1944) edition? Whilst retaining all the virtues of presentation of the earlier book, including the same chapter headings and attractive lay-out, the new edition has been almost completely re-written in every section and much new information added so that the book is almost half as long again as its predecessor. Indeed no aspect of post-war refractories development has escaped Dr. Chesters' attention. In the first part of the book, which deals with materials and testing, every chapter contains new information of interest to the foundryman. Thus for the first time, probably, he will be able to read full, but concise, descriptions of the production of magnesite from sea water (described by Dr. Chesters as "one of the outstanding developments in refractories of the first part of the twentieth century"), of improvements in basic materials such as graded dolomite and (briefly, this) the magnesite-chrome brick, and last, but not least, of the development of the super-duty silica brick that now holds supreme place as a roof refractory. This last description is based mainly on the post-war development of bricks of the low-alumina high-titania type prepared from fine-grained South African silcrete material. Mention is also made of German interest in medium-fired silica bricks having an improved thermal shock resistance (at least above 600 deg. C.); these may be of greater importance to foundry than to ingot steelmakers, especially where top-charged arc furnaces and daywork or two-shift melting schedules are used. Presumably the other important British development in super-duty silica, namely the manufacture of bricks from indigenous cretaceous flint, rather than from quartzite, was of too recent development for mention in this edition.

The second half of the book is devoted to applications of the refractories, described in the first part, to the various steelmaking processes. The most significant developments here, the all-basic open-hearth furnace, the investigation of gas-flow patterns and of iron-oxide deposition in open-hearth furnaces (a field in which Dr. Chesters has himself been actively engaged for several years) are admirably treated, but are not, of course, major interests of the foundryman.

The chapter on electric steelplant has been extensively re-written, mainly in such a way as to improve clarity of presentation, though some new information is also included. An innovation in the new edition is a description of the acid arc furnace used "particularly in the manufacture of steel castings"; the description is, however, very brief indeed and of little practical help to the steelmaker. Induction furnaces are dealt with along the same lines and in about the same detail as in the original volume.

There is obviously much to attract one in any scheme for making steel "without fuel"—as Bessemer described his original process—and undoubtedly, for certain grades of carbon steel, the converter process will always be economic. Foundries, however, have in recent years turned away from the converter to the more flexible and convenient arc and high-frequency processes, partly under the stimulus of engineering demands for higher casting quality. In what is probably the most forward-looking chapter in this forward-looking book, Dr. Chesters shows that the days of the pneumatic process are not yet numbered; indeed it has recently undergone a steady revival, in several forms, even for "quality" steels. It may once more, in highly competitive cost conditions, become a major producer of molten metal in the steel foundry.

Though foundrymen do not use a casting pit as such, they are very interested in what are collectively described as "casting-pit refractories" since these include ladle bricks, nozzles, stopper-rod covers and ends, as well as runner bricks and tiles. The controversy between bloating and non-bloating types of fireclay continues, but of the advantages of lower porosity in ladle bricks there seems to be less doubt. Mention is made of the advantages possessed by the rammed siliceous ladle linings used successfully in Continental foundries but found to be less satisfactory over here—possibly due to lack of experience in the foundry with

this type of construction.

Casting-pit refractories have long been believed by many to be an important source of non-metallic inclusions in steel. Dr. Chesters does not appear to share this view, but suggests that a radioactive "labelling" of specific refractories might conveniently be used to decide this point. It is not until very recently that suitable radioactive materials for this type of investigation have become available and work (by the reviewer, amongst others) is already proceeding along these lines. It is, perhaps, one measure of the tremendous impact that the scientific way of thinking has had on foundry problems that probably the earliest use of radioactive tracers in this connection in Britain was in the location of the source of inclusions in the surface of alloy-steel *castings*. There seems, as Dr. Chesters says in his final paragraph, "little doubt that such observations will be rapidly multiplied when radioactive tracers are adopted"—not only in foundries, but in steelmaking generally.

D. H. H.

New Catalogues

Laboratory Furniture. Griffin & George, Limited, Ealing Road, Alperton, Middlesex, have issued a 40-page well-illustrated brochure covering a useful service which was not available to the old-time chemist. Fifty years ago, and even more recently, the chief chemist had to convert a room into a laboratory and when his services assumed some importance, then he designed the layout of new premises for himself. The present publication, however, makes the task relatively easy, as all the furniture, be it metal or wood, is available "off the shelf" and all the chemist has to do is to see that the laboratory walls, floor and ceiling are constructed of suitable material. This catalogue should find a place on the bookshelf of all those in charge of laboratories, because sooner or later, they will have to expand or modify in some way. With the catalogue came a price list of apparatus for testing soils, bituminous materials, aggregates, plaster, concrete, and the like.

Modern Management Consultants. Mead Carney & Company, Limited, 42, Hill Street, London, W.1, is a branch of a well-known American firm of consulting engineers. A brochure which they have published outlines, with many examples of successes, the services they provide to achieve increased efficiency in industrial enterprises. Amongst the list of clients, there are quite a number of Government departments, State, and municipal undertakings, as well as internationally known manufacturing concerns. The brochure is well and convincingly written.

Electro-plating. Only a very few foundries carry out electro-plating on a large scale, but those that do so will be interested in a brochure (No. C.23) issued by Electro-Chemical Engineering Company, Limited, Sheerwater, Woking, Surrey. It describes and illustrates a range of fully-automatic plants, where all horizontal movements are carried out by means of pushers—attached to rigid reciprocating bars—to the exclusion of chain conveyors.

Electrically-driven Rotary Compressors. Consolidated Pneumatic Tool Company, Limited, 232, Dawes Road, London, S.W.6, have issued a supplement to their catalogue No. 38 which describes and illustrates three models of compressors, two of which are shown mounted on wheels and the third on a skid.

Publications Received

Brazing of Aluminium and its Alloys, published as *Bulletin No. 22*, by the Aluminium Development Association, 33, Grosvenor Street, London, W.1; price 2s.

Brazing is now an established method of joining aluminium and its alloys, giving for many applications both economic and technical advantages over other metals. The Ministry of Supply has now approved a specified brazing process for many classes of work.

The *Bulletin* opens with a brief comparison of the principal methods of brazing—flame, furnace, and flux-dip—and then deals with the basic principles including an essential note on the operation of capillary flow. The properties of aluminium and some of the alloys suitable for brazing are tabulated, and corresponding data are given for aluminium filler-alloys together with notes on the extremely useful form of clad brazing sheet. Preliminary notes to the operations proper include information on fluxes, references to joint design, and notes on preparation for brazing, on fluxing, and stopping off.

The different brazing procedures of flame, furnace and flux-dip brazing are then described, and these are followed by notes on flux removal and the finishing of brazed components. The choice of brazing method is then dealt with in the light of the preceding descriptions, after which the properties of brazed joints are briefly discussed. The *Bulletin* concludes with information on the brazing of aluminium to other metals.

Improvement of Sand-testing Techniques for Shell Mould and Core Sands, being Report No. RPL 13/1 from Watertown Arsenal, and prepared by P. J. Ahearn, F. C. Quigley, and J. F. Wallace. Distributed by the US Department of Commerce, Office of Technical Services, Washington 25 D.C., USA. Price $1.00.

It was found that the conventional test briquettes for shell moulds and sand cores gave inconsistent results due to stress concentrations attributable to shape. A new design of test-piece was thus evolved for this purpose which minimized the concentration of stress. This gave not only a higher apparent tensile strength, but also improved reproducibility for both rammed resin and oil-bonded sands. Steel clips were used to prevent the grips from cutting into the sand specimen but were found to be effective only when shell moulds produced by the "dumping" technique were tested. Using supports of large radius for load application for the transverse bend-test slightly improved the strength and increased the uniformity of the results of the dumped shell moulds, but had little influence on the standard baked-core transverse test.

It would appear from the initial investigations, further work should be undertaken with the objective of ensuring better technical control for shell-moulding under mass-production conditions.

What is Meant by Practical Training, by Sir Walter Puckey. Issued by the Institution of Production Engineers, 10, Chesterfield Street, London, W.1; price 2s. 6d. post free.

This is a reprint of an address which the author gave to the Council of the Institution of Production Engineers, and it discusses the preparation of students for the Dip. Tech. award in all its aspects. It recounts the weaknesses of the employers and the colleges—the latter in their inability to recruit teaching staff of the necessary calibre. The pamphlet touches upon a subject of primary importance to all those having the future staffing of their works at heart.

News in Brief

AS FROM SEPTEMBER 16, the address of the head office of Borax & Chemicals, Limited, will be 35, Piccadilly, London, W.1 (telephone: REG 2751).

WHEN 30 APPRENTICES signed on at Steel, Peech and Tozer, Rotherham, on September 2, each was given the pen with which he signed.

UNEXPECTEDLY HEAVY DEMANDS from British industry for space at the Trade Fair in Helsinki resulted in some Midland firms getting less space than they requested.

IT IS CONFIRMED from official sources that the Caterpillar Tractor Company, Limited, of Glasgow, have no plans to include a foundry in their manufacturing set-up.

THE MERTON AND MORDEN SCIENTIFIC CIRCLE are to include a display of foundry equipment and to demonstrate moulding, patternmaking, etc., at their annual exhibition on October 2.

THE EAST MIDLANDS DIVISION of the National Coal Board are to consider piping methane gas which has interfered with coal production at Harworth Colliery, near Doncaster, and using it for industrial purposes.

SEVEN MEN were injured in an explosion in the power house of the Workington Iron & Steel Company, Limited, on September 5. The explosion occurred when a transformer was being recommissioned after an inspection and oil replacement. It was stated that production was not interrupted.

THE BIRMINGHAM SECTION of the Institution of Production Engineers are holding a meeting on September 18, at the College of Technology, Gosta Green, commencing at 7 p.m., when two of the following films will be shown: "The Kitmat Story," "Steelmans Servant," and "Atomic Achievement."

MODELS SHOWING the latest British advances in nuclear-power station developments are being shown in the official UK pavilion at the Levant Fair, at Bari, in Italy, from September 7 to 25. The display includes models of Calder Hall atomic-power station, and the fast-breeder reactor being built at Dounreay, on the north coast of Scotland.

BRITISH TRANSPORT WATERWAYS has placed a number of contracts for equipment in connection with work to be carried out on canal modernization. These include contracts to Thomas Smith & Sons (Rodley), Limited; Parsons Engineering Company, Limited; Brown & Tawse Plant, Limited, and Crone & Taylor (Engineering), Limited.

FIRST COMMERCIAL PRODUCTION, in this country, of neutron-source tubes (which will start up the two reactors at the Bradwell nuclear-power station by initiating a chain reaction in the fissionable reactor) is being undertaken by the Tube Investments subsidiary, Talbot Stead Tube Company, Limited, Walsall, on behalf of the Nuclear Power Plant Company, Limited.

RADIATION GROUP SALES, LIMITED, announce that the New World gas convector No. 460 has just been released to the gas industry. This appliance, which is flueless, is primarily a background heater suitable for installation in large rooms, halls or shops. It has been designed to permit a high heat output, whilst the surface of the appliance remains very cool, thus enabling it to be fixed close to a wall.

AT UNIVERSITY HALL, SHEFFIELD, on September 2, 22 senior boys from 15 public schools started a six-day course on iron and steel production, research and management. The course, arranged by the United Steel Companies, Limited, includes visits to works and laboratories in Sheffield, Rotherham, Stocksbridge and Scunthorpe. From September 9 to 14, 38 undergraduates from 11 universities started a similar course.

MR. JOHN BANCROFT WILLANS, of Dolforgan, Kerry, Montgomeryshire, former High Sheriff of Montgomeryshire, and member of the Council of the University College of Wales, Aberystwyth, since 1914, left £113,532 (£113,120 net). In addition to other bequests, £1,000 has been left to the University College of Wales, Aberystwyth, £500 to the Presbyterian College, Carmarthen, and £500 to the National Library of Wales, Aberystwyth.

THE SIR JOHN CASS COLLEGE, Jewry Street, Aldgate, London, E.C.3, announces an extensive list of lectures for the autumn session. Amongst the subjects covered are:— Industrial Law; Absorption Spectroscopy; Spechtrochemical Analysis; Domestic and Industrial Fuel; Fuel Techniques; Solid and Gaseous Fuels; and Liquid Fuels and Fuel-plant Technology. Further particulars can be had on writing to the secretary of the College at the address quoted.

AN INTERNATIONAL PRODUCTS DIVISION, with world-wide representation, has been formed by Thermotank, Limited, Glasgow, to handle the sales and distribution to the trade of various products concerned with air conditioning, heating, and ventilating. Branch offices have been opened at all the overseas offices of Thermotank, and one of the first effects will be the availability throughout the world of all Thermotank punkah louvres and air distributors.

FOR THE FIFTH SUCCESSIVE YEAR, Wild-Barfield, Electric Furnaces, Limited, will be exhibiting equipment at the Zagreb fair; Mr. W. R. Brew, sales manager (furnace division) will be in attendance. Past years have shown that the range of furnaces manufactured finds a ready market in Yugoslavia, despite certain economic difficulties. Business there has been most satisfactory, and it is confidently expected that the market will be an expanding one.

UNITED STEEL COMPANIES, LIMITED, in their Orgreave works, near Rotherham, are using a new product—Orkot—as rolling-mill bearings. This is fibre or fabric bonded by synthetic resins. The average tonnage rolled has increased five-fold; the bearing cost per ton reduced from 1s. 4d. to 5¼d.; the annual bearing renewal cost cut from £1,034 to £410; and consumption of power has gone down from 61 units to 35 per ton of steel rolled. This is not good news for the foundry industry.

THE PROSPECT of further substantial industrial development has been opened for the new town of Glenrothes, Fife, as a result of discussions between Beckman Instruments Inc., California, USA, and the Scottish Council (Development and Industry). The Beckman company have formed a British subsidiary, Beckman Instruments, Limited, and are negotiating with the Glenrothes Development Corporation for some 20,000 sq. ft. of factory space. It is intended that the British company shall make precision rheostat potentiometers.

THIS YEAR the subject of the Sir Alfred Herbert Paper is the "Bases of Measurement." It will be presented by Dr. H. Barrell, D.SC. (superintendent, metrology division, National Physical Laboratory) to a meeting of the Institution of Production Engineers, which will be held at the Royal Institution, Albemarle Street, London, W.1, on Thursday, October 31, at 6.30 p.m. The meeting will be open to both members and non-members of the Institution, but admission will be by

News in Brief

ticket only. Those wishing to attend should apply to the secretary, at 10, Chesterfield Street, London, W.1.

THE FOLLOWING THREE RESIDENTIAL CONFERENCES are being organized by the Institute of Fuel. The first, with the theme "Science in the Use of Coal," will be held at the University of Sheffield from April 15 to 18, 1958; the second, a symposium on combustion which has been organized in collaboration with the Combustion Institute, will open at the Royal Institution in London on August 28, and continue at Oxford from August 29 to September 3, 1958. "Major Developments in Liquid-fuel Firing," is the subject of the third conference to be held at Torquay from May 11 to 14, 1958.

THE DIRECTORS of the Prestige Group, Limited, and George Wostenholm and Son, Limited, announce that they have entered into an agreement whereby the Prestige Group will sell the principal assets of its wholly-owned scissor manufacturing subsidiary, Champion (Mexborough) Limited, to George Wostenholm and Son, Limited. Both George Wostenholm and Son, Limited, and Champion (Mexborough) Limited have manufactured scissors for over 150 years. The sale includes the leasehold properties, stock, plant and machinery, and will be effective from September 30.

General Refractories, Limited announce the following changes in their organization:—MR. ERIC C. S. GREAVES who has been in the company's service for 26 years and has for some years been north western area sales manager, has been appointed to the position of home sales manager operating from the head office at Sheffield; MR. E. C. BRAMPTON, who has been in the technical service division for 17 years, has been appointed to succeed Mr. Greaves (operating from the Manchester office); MR. G. G. ABRAHAM, hitherto north eastern area sales manager, has been made technical service manager at head office, and MR. JOHN G. WATSON is to be Mr. Abraham's successor, operating from the Middlesbrough office.

YORKSHIRE ENGINE COMPANY, LIMITED, Sheffield, have secured an order valued at about £300,000 for the supply of 12 Janus diesel-electric shunting locomotives to the Billingham division of Imperial Chemical Industries, Limited. They will replace an existing fleet of steam locomotives; the first two will be delivered in November, and the third is due for delivery in Mid-1959. The Janus locomotive, introduced just over a year ago, is powered by two 200 h.p. Rolls-Royce diesel-engines, and equipped with British Thomson-Houston electric transmission. It weighs 48 tons, has a starting tractive effort of 30,000 lb., and a maximum speed of 22 m.p.h. Fuel tanks holding 525 gal. enable the locomotive to operate for over 200 hours without refuelling.

THERE ARE NOW MORE PEOPLE in either Montreal or Toronto than there were in the whole of British North America in 1832 when the Bank of Nova Scotia opened its doors for business. So says the current issue of the Bank's *Monthly Review*, which deals with the remarkable growth of the Canadian population in recent years. The *Review* points out that between mid-1951 and mid-1956 two million more persons were added to the Canadian population, which now numbers more than 16,500,000. The rate of growth was faster than at any time since the early years of the century. Indeed, Canada has been showing one of the fastest rates of growth in the world. The population increase of 15 per cent. in these five years is the same as that in Mexico and compares with 16 per cent. in Venezuela, 12 per cent. in Australia, New Zealand and Brazil, 10 per cent. in Argentina and 9 per cent. in the United States.

THE COUNCIL OF IRONFOUNDRY ASSOCIATIONS have issued a poster about the International Competition for Foundry Apprentices, which is being organized by the European Committee of Foundry Associations, and will take place this year in Stuttgart. Three apprentices from the United Kingdom will be going to Stuttgart to take part in the competition. The objective of the poster is not to secure nominations of apprentices to take part in the competition as this is, in fact, in hand. Its purpose is to make the competition well known throughout the industries concerned, and, in particular, among foundrymen and foundry apprentices. The competition will be an annual event held in a different country each year. Apprentice supervisors and others who would like to receive a copy of the poster for display are invited to write to Mr. John Collett, CFA Training Officer, 14, Pall Mall, London, S.W.1.

A COMPREHENSIVE REFRESHER COURSE for senior works and plant engineers is to be held at Bristol University this winter. Organized by the education committee of Incorporated Plant Engineers, in collaboration with leading industrialists and technical authorities, it comprises 19 weekly lectures on Tuesday evenings, commencing October 15. The course covers an extensive range of subjects including the impact of automation on the plant engineer; planned maintenance; oil firing; space heating; thermal insulation of industrial buildings; financial implications of plant installation; electric motors and their control, process heating and lighting; properties and treatment of metals and alloys; industrial accident prevention; compressed air plant; and materials handling. The fee for the course is four guineas and copies of the syllabus and full particulars may be obtained from the secretary to the refresher course, University Engineering Laboratories, University Walk, Bristol, 8.

Elliott and Associated Automation Merger

Recommendation of the merger of Elliott Bros. (London), Limited, manufacturers of electrical measuring instruments, and Associated Automation, Limited, has now been followed by publication of the full details. Elliott-Automation, incorporated in 1950, has been reorganized to effect the merger by acquiring the issued capitals of the two companies.

If the offers become unconditional, Elliotts and Associated Automation propose to declare and pay within 21 days interim dividends of 11¾ per cent. and 4¾ per cent. respectively in respect of the seven months to July 31 last. There will be available for issue later £1,500,000 of preference and £1,387,812 of ordinary capital, but there is no present intention of issuing any of this capital.

The two companies are engaged in sectors of the automation field which are largely complementary and a measure of co-operation already exists. The terms are eight ordinary 5s. Elliott-Automation for four ordinary 5s. shares of Elliott Bros., and eight ordinary of Elliott-Automation for five Associated Automation 10s. ordinary. Holders of Elliott Bros. 5¼ per cent. cumulative £1 preference are offered a one-for-one exchange into 5½ per cent. preference of the holding company. Net assets attributable to Elliott-Automation, exclusive of goodwill, total £5,681,000.

Personal

Mr. DOUGLAS HALL, A.MET., F.I.M., has joined Low Moor Alloy Steelworks, Limited, and Yorkshire Rolling Mills, Limited, as general works manager.

Mr. G. R. WHITEHEAD, a director of John Fowler and Company (Leeds) Limited, and general manager of the Sprotborough works, has severed his association with the company.

Mr. PETER F. TAYLOR, who for the past 14 years has been an assistant teacher at Coatbridge Technical College, has been appointed deputy principal of Burnbank School of Engineering.

Mr. R. COCHRANE, a senior draughtsman of Hurst, Nelson & Company, Limited, Motherwell, has retired after 54 years' service with the company. He was presented with a gold wristlet watch.

Mr. A. C. DUNKLEY, former education officer with the Workington Iron & Steel Company, Limited, has taken up a similar position with Vickers-Armstrongs (Engineers), Limited, Newcastle-upon-Tyne.

Mr. G. N. PETTY has joined the Brush export organization as area director for the Far East and Australasia. Mr. Petty was previously with Napiers, where he was export sales manager, and he has also worked for the diesel and export divisions of the English Electric Company, Limited.

Mr. W. MCLELLAND, who for 12 years has been foundry manager of the Blackheath works of Firth-Vickers Stainless Steels, Limited, has been appointed sales manager for the Scottish and north-east England area of A.P.V.-Paramount, Limited, Manor Royal, Crawley, Sussex, and will also be adviser on technical matters.

Mr. G. SMELLIE of the Steel Company of Wales, Limited, who was until recently works manager of the company's steel division, has been seconded by his company to the British Iron and Steel Federation to act as director, of the Federation's management courses at Ashorne Hill, near Leamington Spa. Mr. H. I. COZENS, C.B., A.F.C., M.A., who recently retired from the Royal Air Force as Air Commodore, has been appointed deputy director.

Last April the British Transport Commission announced that they had accepted a plan of reorganization of the supplies side of their business. The new organization involves the establishment of a separate contracts branch at headquarters under a chief contracts officer, and the appointment is now announced of Mr. S. C. ROBBINS, at present an under secretary with the Ministry of Supply, to fill this position. The reorganization at headquarters also provides for the widening of some of the responsibilities of the stores department and its re-designation as the supplies department. This department has now been placed under Mr. R. B. HOFF, who has been given the title of chief supplies officer; earlier, Mr. Hoff was stores superintendent, B.R. Western Region.

Recent Wills

LEE, C. A., former local director of Thos. W. Ward, Limited, Sheffield £21,473

WHITEHEAD, E. G., a founder and director of the Wolverhampton Die Casting Company, Limited... £71,386

COLLINS, B. K., general manager of Joseph Evans & Sons (Wolverhampton), Limited. pump manufacturers, etc. £10,547

RIVERDALE, Baron, of Sheffield, for many years chairman and managing director of Arthur Balfour & Company, Limited, and of High Speed Alloys, Limited £87,226

Obituary

COLIN GRESTY

The death occurred on Monday of Mr. Colin Gresty, a director of North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne. Early in 1912, Mr. Gresty entered the metallurgical laboratory of North Eastern Marine, being appointed chief metallurgist in 1926, foundry manager in 1927, and general foundry manager and chief metallurgist in 1938, when North Eastern Marine, Richardsons Westgarth & Company, Limited, Hartlepool, and George Clark (1938), Limited became associated. Mr. Gresty had been a member of the Institute of British Foundrymen since 1917 and had many years experience on the General Council becoming national president in 1951. He was secretary of the Newcastle branch from 1924 to 1927, branch president in 1928-9 and again in 1937-8. He was a member of Council and of the technical committee of the Council of Ironfoundry Associations, of the Council and of the research board of the British Cast Iron Research Association, a member of the Iron and Steel Institute, and also of the Institute of Metals. He was president of the National Ironfounding Employers' Federation and was an original member of the "Garrett" committee on conditions in iron foundries. He was the Council of Ironfoundry Association's representative on the Joint Standing Committee on Conditions in Iron Foundries and a member also of the CFA Safety Committee.

Mr. R. W. TALBOT, managing director of the Talbot Estates (Hartley) Limited, proprietors of J. Parish & Company, died on Monday. He and his brother Paul, who died recently, will be remembered as being jointly engaged for many years furthering the development of the well known "Erith" loam sand business.

The death is recorded of Mr. EASON HUMPHREYS, manager of Leyland Motors' Canadian organization from 1920 until his retirement a few years ago. He joined Leyland Motors, Limited, in 1919 and spent a short time at the company's Liverpool office before taking up his appointment in Canada, where he opened offices in Toronto, Montreal, and Vancouver.

The death is reported, on September 4, of Dr. R. W. BAILEY, who recently retired from active duties as consultant to the Metropolitan-Vickers Electrical Company's research department. Dr. Bailey first joined the company (then British Westinghouse) as a college apprentice in 1907. After making a break with industry he returned to Metropolitan-Vickers in 1919 to take charge of the research department laboratory, relinquishing active duties in 1945 to give more attention to special research and development work. An outstanding figure in the field of research, Dr. Bailey is named as the inventor of some 88 British patents, and as author of 35 published papers. He was awarded the degree of D.SC.(Eng.) by London University in 1936, and received from the Institution of Mechanical Engineers the Thomas Hawkesley Premium and gold medal in 1929 and 1935 respectively. In 1949 he was elected a Fellow of the Royal Society; in 1950 he was made an honorary associate of the Manchester College of Technology, and in 1954 he became president of the Institution of Mechanical Engineers. Dr. Bailey served on many technical committees, and is particularly well known for his contributions to the work of the committees of the British Standards Institution, the Institution of Mechanical Engineers, and the British Electrical and Allied Industries Association.

Imports and Exports of Iron and Steel in July

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in July. Totals for the first seven months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended July 31.	Seven months ended July 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Channel Islands	328	3,022	2,216
Cyprus	1,946	4,053	7,793
Sierra Leone	1,091	4,757	8,080
Ghana	2,072	14,786	14,107
Nigeria	4,689	34,559	34,039
Union of South Africa	8,953	44,136	65,390
Rhodesia and Nyasaland	5,111	51,869	40,471
Tanganyika	2,123	13,436	13,575
Kenya	3,796	30,364	30,607
Uganda	414	3,176	2,467
Mauritius	245	1,835	2,119
Aden	124	3,213	2,745
Bahrein, Qatar, and Trucial States	1,288	5,857	8,644
Kuwait	3,246	3,053	19,434
India	17,515	179,962	162,493
Pakistan	7,148	27,616	39,026
Singapore	3,970	17,714	24,755
Malaya	3,341	22,578	22,577
Ceylon	2,892	20,620	17,904
British North Borneo	241	3,859	2,361
Hongkong	6,686	35,997	56,300
Australia	20,653	127,169	123,394
New Zealand	22,198	114,490	121,226
Canada	29,445	176,536	173,726
Jamaica	1,656	14,571	14,052
Trinidad	3,311	22,952	27,139
British Guiana	686	3,059	4,196
Other Commonwealth countries	2,069	15,819	18,486
Eire	3,528	41,560	25,635
Finland	5,011	32,012	52,531
Sweden	5,827	69,361	65,644
Norway	7,829	50,101	68,905
Denmark	7,773	45,589	66,044
Western Germany	1,119	6,556	5,627
Netherlands	8,605	51,766	67,036
Belgium	2,524	21,405	24,155
France	2,057	4,854	12,037
Switzerland	1,064	8,146	11,308
Portugal	1,343	5,894	12,247
Spain	3,299	19,211	26,216
Italy	5,621	11,172	31,496
Austria	825	2,845	2,946
Yugoslavia	1,195	4,580	6,052
Greece	745	3,185	6,140
Turkey	578	2,934	3,620
Netherlands Antilles	115	5,736	2,281
Portuguese East Africa	289	1,979	2,848
Egypt	—	30,034	469
Sudan	994	8,717	11,049
Lebanon	1,528	4,748	4,697
Israel	369	5,838	2,966
Saudi Arabia	13	8,620	2,748
Iraq	6,839	20,372	27,137
Iran	4,659	41,087	39,472
Burma	3,217	4,489	14,501
Thailand	787	4,466	4,865
Indonesia	1,117	7,146	5,362
Philippine Republic	632	4,066	1,757
USA	5,080	27,361	31,317
Cuba	642	5,485	5,706
Colombia	1,028	2,024	3,890
Venezuela	12,740	40,552	68,277
Ecuador	199	1,828	1,652
Peru	454	10,079	6,726
Uruguay	546	3,198	4,746
Argentina	5,466	31,707	47,570
Other foreign countries	13,612	30,183	85,828
TOTAL	276,506	1,681,944	1,922,820

RUDGE LITTLEY, LIMITED, founders, Swan Village, West Bromwich, have had outline plans prepared for the erection of extensions to the National Foundry Craft Training Centre at Phoenix Street, West Bromwich, which forms part of their premises.

Total Imports of Iron and Steel

From	Month ended July 31.	Seven months ended July 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	70	1,856	2,656
Canada	2,839	34,095	30,434
Other Commonwealth countries and Eire	2,046	4,428	14,901
Soviet Union	24,195	179,959	163,938
Sweden	1,961	28,188	18,575
Norway	7,424	58,723	69,015
Western Germany	12,197	135,974	66,999
Netherlands	7,135	62,706	32,078
Belgium	4,067	244,323	95,610
Luxembourg	1,195	42,290	17,872
France	3,644	170,803	39,586
Italy	1,149	7,133	2,605
Austria	6,591	95,465	48,563
Japan	1,133	11,125	8,743
USA	49,084	338,848	153,749
Other foreign countries	2,028	48,348	23,213
TOTAL	126,768	1,464,264	788,537
Iron and steel scrap and waste, fit only for the recovery of metal	99,665	622,595	491,907

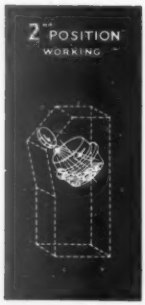
Exports of Iron and Steel, by Products

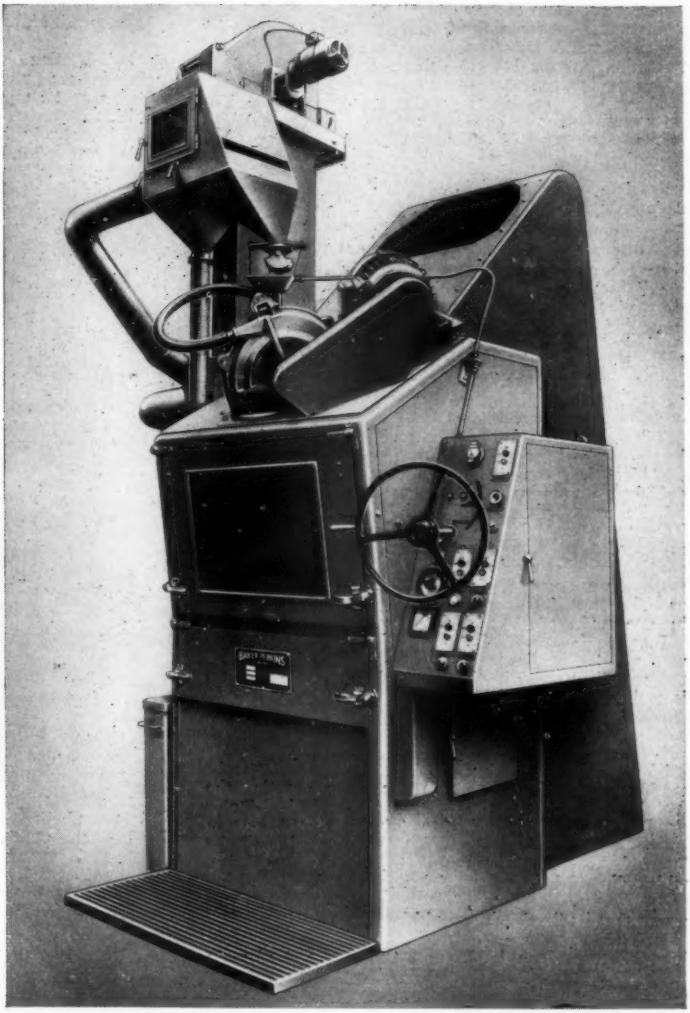
Product.	Month ended July 31.	Seven months ended July 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Pig-iron	5,583	70,522	75,464
Ferro-columbium (niobium)	—	105	70
Ferro-tungsten	6	646	365
Other ferro-alloys	277	2,419	1,921
Ingots, blooms, billets, slabs, sheets, and tinplate bars	91	1,142	780
Iron bars, rods, angles, shapes, and sections	110	1,444	1,158
Steel bars, rods, angles, sections, and shapes	39,609	244,154	274,490
Iron plates and sheets	13	93	95
Universal plates	200	2,818	4,116
Steel plates, $\frac{1}{8}$ in. and under $\frac{1}{4}$ in.	2,168	5,739	7,859
Do., $\frac{1}{4}$ in. and over	12,928	138,394	115,670
Blacksheets and blackplate	26,338	135,802	198,887
Hoop and strip	9,095	53,061	58,604
Tinplate	36,885	173,395	249,080
Decorated tinplate	807	4,131	3,301
Galvanized sheets	15,310	90,236	122,746
Other (including tinned sheets, terneplate, and ternesheets)	1,615	8,799	12,459
Railway and tramway construction material	22,723	176,436	161,815
Wire rods	4,549	22,328	35,270
Wire	10,174	56,935	65,899
Tubes, pipes, and fittings	74,498	458,471	476,770
Iron castings	233	1,263	1,107
Steel castings	221	1,123	1,595
Forgings	837	2,438	4,922
TOTAL	276,506	1,681,944	1,922,820

A NEW INDUSTRIAL LIFT TRUCK which has been built in the Philadelphia plant of the Yale & Towne Manufacturing Company, Limited, has a capacity of 80 tons. It has been designed to move very large dies from storages to presses. In storage the dies rest on supports which allow the platform of the truck to pass underneath; the platform is then elevated and the load transported to the press shop.

BAKER PERKINS Shot Blast Equipment

Rotating Barrel Shot-Blast Machine





BAKER PERKINS LTD
Engineers
WESTWOOD WORKS - PETERBOROUGH

Raw Material Markets

Iron and Steel

With holidays mostly out of the way, demands for pig-iron have shown some increase, chiefly from the engineering foundries for low-phosphorus irons and hematite. The motor vehicle trades continue to step up their schedules for castings and the foundries catering for them are now employed on a much better scale than for some time. Generally, little difficulty is experienced in securing the required supplies of hematite, but the low-phosphorus irons are none too plentiful; in fact, some grades are becoming scarce.

Many of the engineering foundries which make high-duty castings for other trades are also taking up appreciable tonnages of low-phosphorus pig-iron and hematite, and, but to a lesser extent, the refined grades.

There is no appreciable change in the call for high-phosphorus pig-iron, demands for which have been on a subdued scale for some time. The jobbing and some of the engineering foundries are taking up fair tonnages, as they are more favourably employed than the light and textile foundries. Outputs of this grade of pig-iron still exceed demands, with the result that more is being placed into stock at the furnaces.

Limited consignments of all grades of foundry pig-iron, hematite, and refined irons are available for export under licence. Some parcels are being shipped abroad, but there is plenty of competition to face from overseas producers.

With the increasing tonnages of iron ore which are being received from both home and overseas sources the blast furnaces have good supplies available, with sufficient quantities of coke to satisfy consumption requirements. Outputs of basic pig-iron continue to be on a large scale, and the steelworks are absorbing most of the home-produced iron. Consignments continue to be received from abroad, but the steelworks do not now depend on these to the same extent as before, so that a continued reduction in imports may be expected.

Increased outputs of steel semis from home steelworks are providing adequate quantities for most of the re-rollers. Production of finished steel products is maintained at a high level.

Non-ferrous Metals

The persistent weakness of copper dominates the market. Basically vulnerable for some months, the metal tumbled last week. First of all the United States producers cut their price to 27 cents and custom smelters to 26½ cents a pound. This admission of the lack of demand adversely affected the London price, which dipped below the £200 a ton level. Following the announcement by the Rhodesian Selection Trust group that its fixed price would be lowered £10 to £200 a ton, the London price fell further to £190 10s., the lowest figure since 1950. But this was not all: on Monday of this week the RST price was cut another £10 to £190, and the Metal Exchange reacted sharply, cash copper closing the day at £183 5s.

The price may go lower still. The long awaited and expected upturn in demand from the US, which should have begun by now, is absent, and with little optimism abounding concerning the new 1958 car models the outlook for a sharp change in the price trend is bleak. In London, stocks are around 15,000 tons and the contango continues to widen. The one ray of hope is the automatic increase in the amount absorbed each month by the US stockpile. It is understood that 10,000 tons a month is the quantity which will be taken to fulfil long-term defence contracts at the present price.

Tin is quietly steady on both sides of the Atlantic, and in view of the possible operations by the buffer stock manager prices are not expected to show much change in the immediate future. In London, the contango is still in being, but is not very wide, in spite of stocks being around 4,000 tons.

Demand for lead is reasonably good. In London the price is still receding, but this would appear to be in sympathy with the copper price and may have been overdone. Certainly any increase in the offtake would put the London price higher. In America the price is 14 cents a pound and demand is concentrating itself on spot supplies, thereby reflecting fairly stable conditions.

Zinc is steady both here and in New York. In London the price, like that of lead, has fallen away in sympathy with copper, but the undertone is good. In America demand is mainly for spot supplies of Prime Western at 10 cents, East St. Louis, although demand for special high-grade zinc is not absent.

Head Wrightson Agreement with French Firm

The Thornaby-on-Tees steel plant manufacturers, Head Wrightson & Company, Limited, announces that it has made an agreement with Compagnie de Fives-Lille, S.A., of Paris and Lille, covering the manufacture and sale in France by Fives-Lille of the full range of ironmaking equipment designed and manufactured by Head Wrightson in conjunction with Arthur G. McKee & Company, of Cleveland, USA.

The agreement, which has the support of the French Government, will enable Head Wrightson and its American associate to participate in the large programme now being implemented by the French iron and steel industry, particularly on the ore-preparation side. A number of ore-preparation and sintering plants are planned in addition to the large new steelworks at Dunkirk.

A CANADIAN SUBSIDIARY, the Newall Machine Tool Corporation of Canada, Limited, has been formed by the Newall Engineering Company, Limited, Peterborough (Northants), to manufacture and distribute the parent organization's products in North America. The new company is registered in Toronto.

A JOINT MEETING of the Blackburn branch of the Incorporated Plant Engineers and the Institute of Fuel will be held on September 19, at the Golden Lion Hotel, at 7.30 p.m. Rear-Admiral Sir Sidney Frew, K.B.E., C.B., will be the speaker and he has taken for his subject the "Fuel and Power Position in the United Kingdom."

FACTORIES OF THE BRUSH GROUP exhibiting at the British Trade Fair, which is currently being held in Helsinki (closing date September 22) include J. & H. McLaren, Limited, Leeds, who are featuring diesel engines and generator sets; Brush Electrical Engineering Company, Limited, Loughborough, whose display will consist of path alternators, induction motors and paraffin and diesel engines; Mirrlees, Bickerton & Day, Limited, Stockport, who will display a model of the K8 industrial diesel engine; and the National Gas & Oil Engine Company, Limited, Ashton-under-Lyne, who will be showing a M4A4 normally aspirated diesel engine. The Fair is claimed to be this country's largest venture overseas to date.

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—Foundrymen who want to strengthen natural sand

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CMF11

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

September 11, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S. 1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £53 5s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 7d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £96 0s. 0d. to £99 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. per unit; over 6 per cent. C, £94 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 33s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3d. to 2s. 3¼d. per lb. Cr; 0.10 per cent. C,* 2s. 3¼d. to 2s. 3⅜d. per lb. Cr; 0.06 per cent. C,* 2s. 3½d. to 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 0d. to 23s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £87 19s. 3d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £33 1s. 6d.; tested, 0.08 to 0.33 per cent. C, £34 1s. 6d.; hard (0.41 to 0.60 per cent. C), £35 3s. 0d.; silico-manganese, £44 2s. 6d.; free-cutting, £37 5s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 7s. 0d.; silico-manganese, £44 10s. 0d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 18s. 6d.; acid, up to 0.25 per cent. C, £43 10s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 12s. 0d.; boiler plates (N.-E. Coast), £45 2s. 0d.; floor plates (N.-E. Coast), £44 1s. 0d.; angles, N.-E. Coast, £40 6s. 6d.; joists, N.-E. Coast, £40 2s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over, £40 8s. 0d. (under 10 tons to 4 tons, £41 5s. 6d.; under 4 tons to 2 tons, £41 10s. 6d.); hoop and strip, coils, £40 10s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £45 16s. 0d.; black sheets (hand mill), 24 g., £59 4s. 6d.; galvanized corrugated sheets, 24 g., £68 17s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £69 9s. 6d., nickel-chrome, £100 12s. 6d.; nickel-chrome-molybdenum, £112 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £187 5s. 0d. to £187 10s. 0d.; three months, £190 5s. 0d. to £190 10s. 0d.; settlement, £187 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 10½d. per lb.; rods, 219s. per cwt. basis; 20 s.w.g., 252s. 3d. per cwt.

Tin.—Cash, £736 10s. 0d. to £737 0s. 0d.; three months, £737 10s. 0d. to £738 0s. 0d.; settlement, £737 0s. 0d.

Lead (Refined Pig).—First half September, £90 0s. 0d. to £90 2s. 6d.; first half December, £90 5s. 0d. to £90 10s. 0d.

Zinc.—First half September, £73 17s. 6d. to £74 0s. 0d., first half December, £73 10s. 0d. to £73 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £107 5s. 0d.; rolled zinc (boiler plates), all English destinations, £105 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £85.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 6⅞d. per lb.; sheets to 10 w.g., 168s. 9d. per cwt.; wire, 2s. 4½d.; rolled metal, 168s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £136; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £193; HTB2 (38 tons), — ; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £170; LG3 (86/7/5/2), £179; G1 (88/10/2/½), £237; (88/10/2/1), £230.

Phosphor Bronze.—BS1400, PB1 (AID released), £257 per ton.

Phosphor Bronze Strip, etc.—Strip, 242s. 3d. per cwt.; sheets to 10 w.g., — per cwt.; wire, 3s. 7½d. per lb.; rods, 2s. 11¾d.; tubes, 2s. 11½d.; chill cast bars: solids 2s. 10¾d., cored 2s. 11¾d (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide x 0.056, 3s. 5½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 10½d.; special quality turning rod, 10 per cent., ½ in. dia., 3s. 10½d., in straight lengths, 3s. 9½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £85 0s. 0d. to £87 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £242; AB2, — .

* Average 68-70 per cent.